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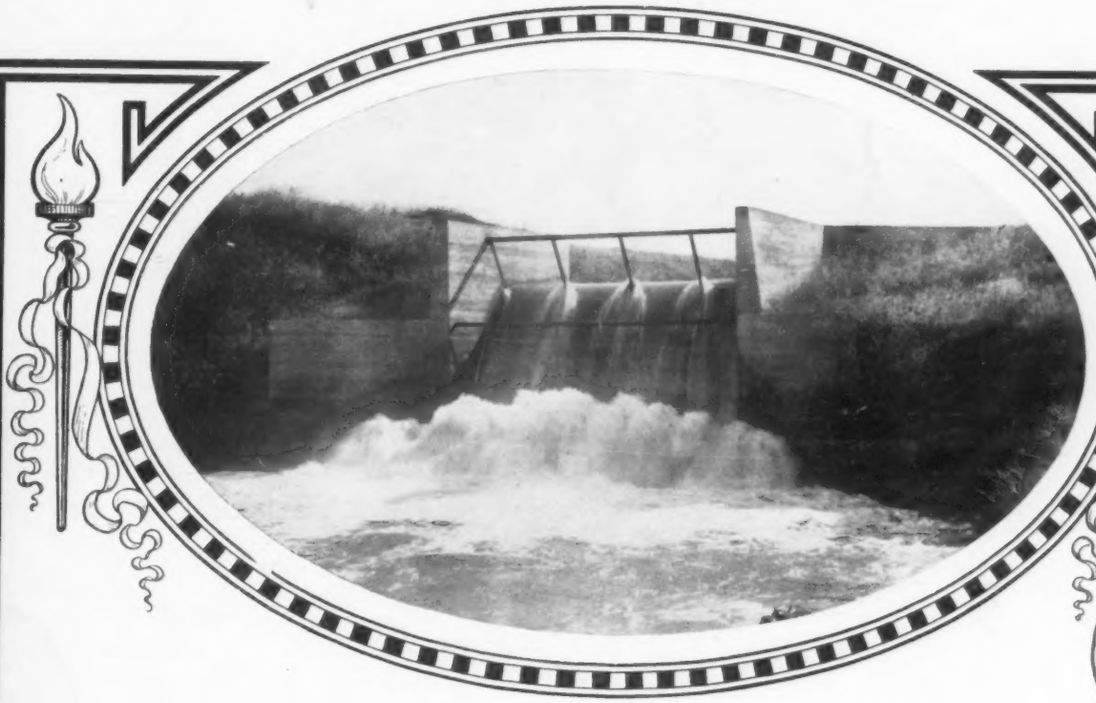

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Alphabetical Index to Advertisers, Page 8. **Where to Buy It in the West, Pages, 9, 10.**

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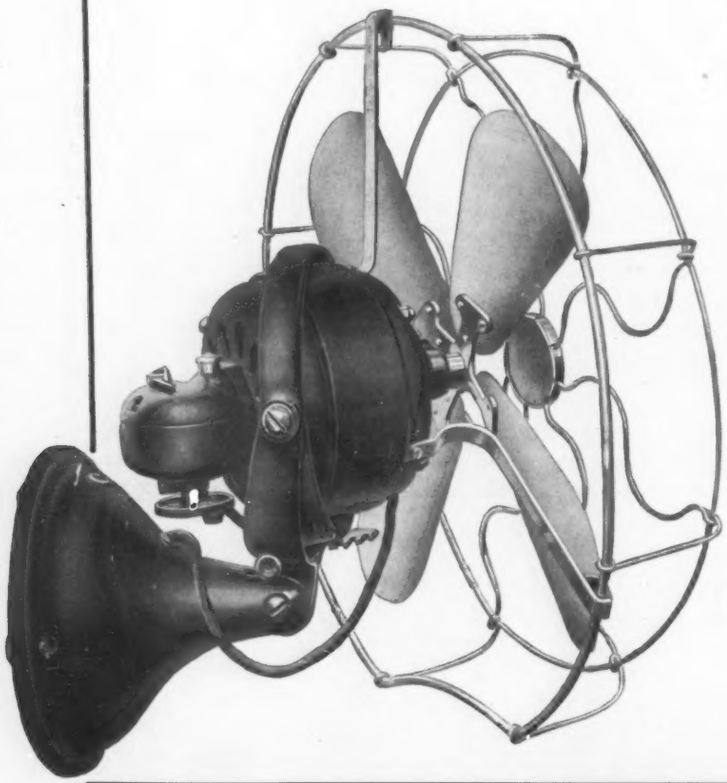

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ELECTRICITY IN THE CEMENT INDUSTRY

BY L. D. GILBERT.

Portland cement was discovered before Christ. The Romans used it in the construction of the Pantheon, which has for 2000 years withstood the ravages of storm and time.

Cement was a lost art for a great many years, and was re-discovered by an English engineer, who built the Eddystone lighthouse of cement in 1759, and this structure is as substantial today as when it was constructed.

It, however, remained for the Germans to take up the manufacture of cement and make it an article of commerce. This is why it is often said that Germany is the mother of the cement industry.

The development of the American cement industry during the past decade has been one of the marvels of the age.

Portland cement concrete has come to be recognized as the ideal building material for all first-class construction work, and is conceded to be the greatest advancement in building construction since the introduction of structural steel, which ranks first, with Portland cement concrete a close second. Portland cement is in addition, gradually but surely, overcoming this lead. Concrete will be used in more different forms than any other known structural material. For instance, the railroad tie of the future will be of concrete, country roadbeds of the future will be of concrete, cement pipes for drains, sewers and water lines, telephone, telegraph, electric transmission line poles, fence posts, piles, wharves, bridges, barges, lagging and props for mines, and a thousand other uses that cannot here be enumerated.

There is no limit to the future of Portland cement. It is now used in almost every building or structure that is being erected. If the structure be of steel, concrete is used for foundations, fireproofing, floors, etc. When a structure is put up of thus material, it stands for ages and is as solid as the rocks of Gibraltar.

A Pacific Coast Cement Plant.

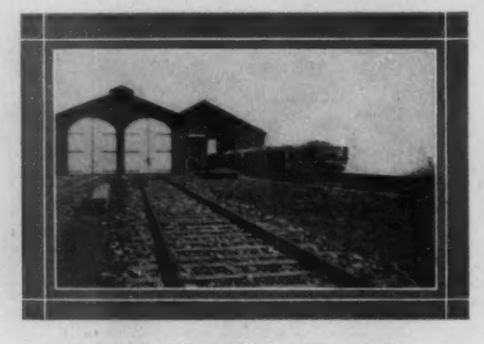
Too much emphasis cannot be placed on the fireproof quality of concrete construction. For example, in the great conflagrations at Baltimore and San Francisco the concrete structures remained practically unharmed, when the unquenchable walls of flame swept over and destroyed all other forms of buildings. The report of the National Board of Fire Underwriters on the San Francisco disaster shows that less than five per cent of the reinforced concrete floors were materially damaged.

The growth of the Portland cement industry has increased more than any other industry in the United States. This can be shown from the fact that for fifteen years prior to 1895 the growth of the industry

was slow though constant, and in the year 1895 the statistics of the Department of the Interior showed the output for the entire United States to be 990,324 barrels, while the estimated output for the entire United States for the year 1912 will run over 80,000,000 barrels, showing the production of 1912 to be eighty times that of 1895, this covering a period of seventeen years.

What we today understand as Portland cement is a certain compound of silica, alumina and lime in the proportions of 20 to 23 per cent of silica, 8 to 10 per cent of alumina, and 62 to 65 per cent of lime. It is not possible to obtain these ingredients in large quantities in the state of absolute purity, and we find alumina replaced by ferric oxide (or iron) and lime by magnesia, to three, and as high as four per cent, so that the cements found on the market today deviate slightly from the above analysis, without suffering greatly in their physical properties.

There are a number of other chemical compounds which harden or set when mixed with water. The importance of the use of Portland cement, commercially, as against the use of other compounds having the same properties, is because of the cheapness with which it can be manufactured, and not because of any peculiar properties not possessed by a number of other compounds. The mere mechanical mixture of silica, alumina and lime in the above proportions will not yield a Portland cement—it is essential that the ingredients be combined, and practically the only way in which such a union can be brought about is by a fusion of the mixture.



Cement Crusher Building and Locomotive Round House

Raw materials entering into the manufacture of cement are found in almost every state in the union. The raw materials that are used are marl mixed with limestone, shale mixed with limestone, clay mixed with limestone, and blast furnace slag mixed with limestone.

In the manufacture of Portland cement there are two methods commonly used, the dry process and the wet process. In the dry process the materials after coming from the quarry are crushed, mixed, dried and pulverized, ready for the kiln in the dry state, while in the wet process, the materials coming from the quarry are crushed, mixed, but in the pulverizing, water is added to the extent of 35 to 40 per cent. In order to give you an idea of the process of the manufacture of Portland cement we will take as an example a plant in which the process is wet. The materials in this process are shale and high lime, the fuel coal, the grinding machinery, ball and tube mills, and power, electricity, using induction motors.

In the quarry, which is adjacent to the plant, the limestone and shale lie side by side in a blanket vein, with a face of from forty to fifty feet in height above the quarry floor. In quarrying, a well-drill, such as is used for drilling the ordinary well, is used for drilling the blasting holes. A series of 5⅝ in. diameter holes are drilled along the face of the quarry, twenty-five to thirty feet back. These holes are then sprung and loaded with explosives. A number of holes are connected up and with the aid of a battery,

Limestone by the Trainload for Cement Manufacture in California

are shot at the same time, a single blast sometimes bringing down thirty to forty thousand tons of rock. After blasting, the rock is loaded into dump cars by the use of a steam shovel, and are hauled to the crusher by a steam locomotive.

After arriving at the crushing department the contents of the cars are dumped into a crusher and crushed so that all of the product will pass a 2½ in. ring. The material is then elevated and delivered into storage bins, the crusher doing service for both materials alternately, but the materials are stored in separate bins side by side preparatory to proportioning, or mixing. From the rock storage bins the limerock and shale are drawn out separately upon a belt conveyor which passes through a tunnel under the bins, and is conveyed to the proportioning bins, which are set side by side over a pair of automatic tandem scales. The scales are set by the chemist of the factory, to weigh out and deliver to the ball mills the proper proportions of limerock and shale. We now have in the bins over the ball mills what is termed the "mix." The "mix" is then fed into the ball mills by a mechanical feeder which is regulated to suit the capacity of the mill. At this point the water is added in the proper quantities to give the ground mix 35 to 40 per cent moisture, according to the physical properties of the material. The material now is reduced to a fineness that all will pass a 16 mesh sieve and is spouted direct to the tube mill. The ball mill in the grinding process, as described above, is the granulator and the tube mill is the pulverizer.

The ball mill is one of the old reliable granulators that has been used in the cement industry for years. It consists of a cylinder of about 8 ft. in diameter by about 6 ft. long, lined inside with steel plates, so as to form a series of steps. The cylinder is carried horizontally on a shaft passing through its axis, and is supported on two bearings, one end of the shaft being fitted with a large spur gear, which in turn

meshes into a small pinion, mounted on the pinion shaft. The pinion shaft is carried on three bearings and is fitted with a pulley, or an elastic coupling for belting or connecting the motor direct. The larger sizes are charged with 10,000 to 12,000 pounds of steel balls, ranging in size from three inches to five inches in diameter, the mill requiring from 100 to 125 h.p. motors to drive it at a speed of from 22 to 23 r.p.m. The material is fed into the mill through an open

Crusher Building

spider on the end of the cylinder opposite the main gear. The ground material is discharged through screened port-holes near the periphery of the shell in the side plate opposite the feed end. Ball mills have a capacity, preparing tube mill feed, of 1500 to 2000 pounds of raw material per hour, per 1000 pounds of balls in the charge, according to the physical properties of the material.

The tube mill, as before stated, is a pulverizer, and is used for fine, or to finish grinding the material from the ball mill. It consists of a cylinder about 6 ft. 6 in. in diameter by 20 ft. to 22 ft. in length, and is lined inside with silex (or flint bricks), which are 2 to 2½ in. thick, laid in cement mortor. The inside of the tube mill when lined is comparatively smooth. The mill rotates horizontally on two trunnions, supported on bearings, forming the heads or ends of the cylinder, and is driven by a gear and pinion similar to the ball mill, the material being fed through a hollow trunnion at one end, and the finished material discharging through a hollow trunnion, or through screened discharge ports in the periphery of the shell opposite the feed end. The grinding medium is flint pebbles, ranging in size from a hen egg to a goose egg. The mill is charged about half full of these pebbles. There are no screens (other than those to retain the pebbles) used on this machine, the fineness of the material being governed by the fineness and quantity of the material fed to the mill—the greater the quantity of material fed to the mill the coarser the product and vice versa. It will take a motor of from 150 to 175 h.p. to drive a mill of this size at a speed of 22 r.p.m.

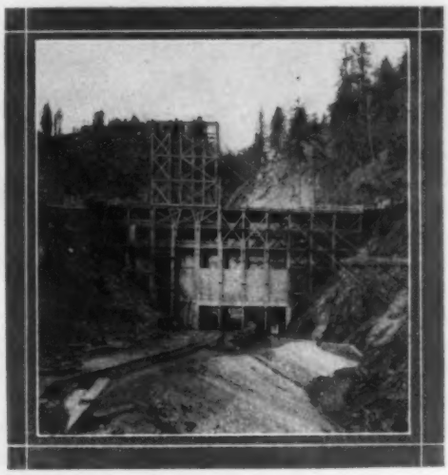
The "mix" now, after passing through the ball and tube mill and ground to a fineness such that about 90 per cent will pass a 200 mesh sieve and of the consistency of thick cream (called slurry), is pumped by compressed air to the slurry tanks in the kiln building.

The kiln in which the fusion (or burning) is done is a cylinder 9 ft. in diameter by 200 ft. in length, and is built of heavy steel plates riveted together, and is carried on steel tires rolling on steel rollers. Near the center of the kiln is a train of gears, the pinion of which meshes into a girth gear, bolted to the kiln shell. The kiln is set on a pitch of ½ in. per foot, pitching toward the firing end. The kiln is lined with high quality special fire brick which have a thickness of 9 in., 6 in., and 4 in. respectively, beginning at the firing end. The total weight of the kiln, as described, is about 500 tons, and is driven by a 50 h.p. variable speed motor, having a speed ratio of 3 to 1. The motor is controlled from the burning floor and rotates the kiln at a speed of from ¼ to ¾ r.p.m.

The burning of the material in the kiln is done by the use of powdered coal, which is ground to a fineness such that 85 to 90 per cent will pass a 200 mesh sieve. This is blown into the kiln by a low pressure air blast, creating a temperature in the clinkering zone of from 2500 to 3000 degrees Fahrenheit, which, after passing the length of the kiln is reduced to from 450 to 500 degrees, escaping through a large stack.

The slurry is drawn from the slurry tanks and pumped to an automatic feeder and is fed into the kiln at the stack end. The moisture and carbonic acid are driven off by the heat, and clinker is formed as the mixture gradually travels through the kiln. The clinker at a temperature of from 1500 to 2000 degrees Fahrenheit is discharged directly into a cooler where it comes in contact with a current of air and is cooled sufficient for handling.

The cooler is a steel cylinder carried on steel tires and rollers similar to the kiln but smaller, being only about 6 ft. in diameter by 60 ft. in length, and

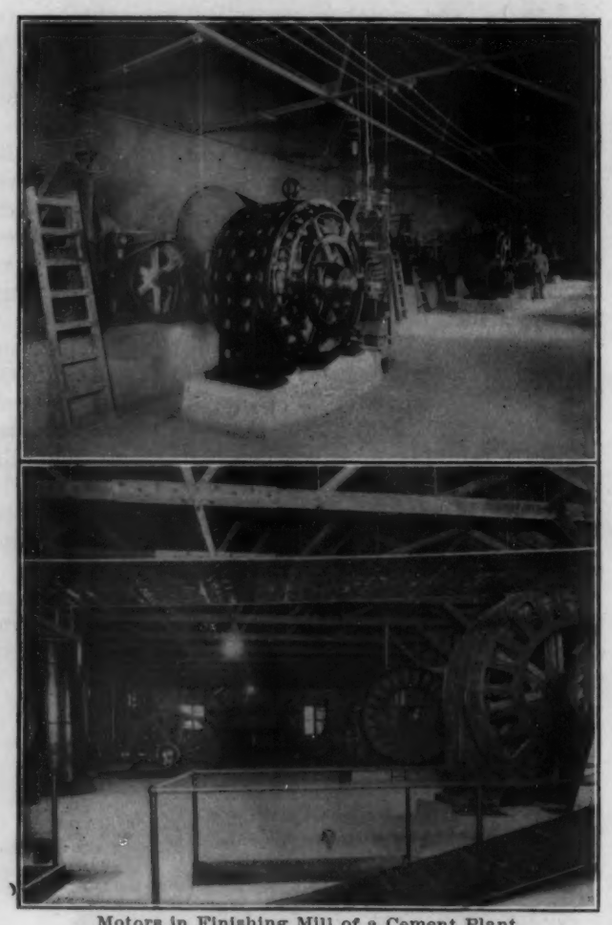


Rock Bins at the Quarry

is set on a pitch of ¾ in. per foot and is motor driven at a speed of about 3 r.p.m. by a 20 h.p. motor. A low pressure fan connected to the discharge end supplies the air for cooling.

The clinker, coming from the cooler, is conveyed to the clinker storage bins. It is then drawn from the clinker bins and delivered to the cement grinding department where about 2 per cent of gypsum is added. This is done in order to govern the setting time of the finished cement. It is then delivered into a bin over the clinker ball mills similar to the ball

mills in the raw grinding departments. The granulated clinker coming from the ball mills (all of which will pass a 16 mesh sieve) is delivered to the cement tube mill bins. These latter two mills are motor driven and are practically a duplicate of the mills in the raw-grinding department. In the cement-grinding department the clinker is ground in the dry state. The finished cement is then delivered to the stock house and thence to the packing department, where it is automatically weighed into the sacks, each sack holding 95 pounds and taking four sacks to make a barrel, the unit upon which all costs, output, etc., at the factory, are based.



Motors in Finishing Mill of a Cement Plant.
Motors and Compressors.

Electricity has been a very important factor in the development of the cement industry. The old two-kiln cement factory, with a capacity of from 250 to 300 barrels per day of 24 hours, was shaft-driven, the engine being belted to the line shaft. A small engine-driven d.c. generator set was generally installed for the use of lights only. All the crushing, granulating, and pulverizing machinery was located adjacent to the line shaft which passed through the engine-room walls on either side, causing the engine-room to be located in the center of the plant, where it was impossible to exclude the dust, obtain light, or get ventilation. As cement plants operate 24 hours per day and seven days per week, a continuous operation becomes a vital factor. It is therefore no wonder that in the old belt-driven plants the maintenance was high and the efficiency and load-factor low. Every machine was belted to the line shaft which as a rule was equipped with a great number of friction clutches, that with their complication of levers and springs, when filled up with cement dust, did not help matters any, in fact, even gave a great deal of trouble and caused numerous shut-downs of the entire plant, it being necessary to shut down the entire plant to do any repair work on the shaft, clutches, or belts.

In the later designed plants, electricity became more in evidence. The major portion of the power was delivered to the mills by line shafts. Some of the small power consuming departments, such as the crushing department, coal grinding department, packing department, and generally an auxiliary drive for the kiln department, were motor driven. As a rule these motors were all direct current and required a great deal of care and attention. They did not operate very satisfactorily in the cement dust, and when they were enclosed it was almost impossible to get good ventilation, consequently the burn outs were numerous.

The cement industry was growing rapidly—far more rapidly than the most optimistic cement companies had anticipated. The orders came in faster than they could be filled, and it became necessary to increase the plant output. Plants that had been running less than a year decided to double their capacity. Most of these had been designed without any provision for increasing their capacity. The line shafts were full of pulleys and the engines were overloaded. The problem then confronted the operators as to how they could increase, without remodelling the old plant from end to end or build a new one.

The electric motor solved the problem. It was a simple matter to install more boilers and engine driven generators. If there were no room in the old power house, a new one could be erected. Crushers, mills and kilns could then be added without any regard to their relation to the old line shaft.

A great many plants that were increased used a short line shaft driven by a large motor, from which three or more mills were driven as a battery, but the individual motor drive proved, however, the more satisfactory and efficient. With the individual motor drive, and with fairly large bins over the mills, in the various stages of the manufacture, units could be shut down for the necessary slight repairs independently of one another, and in this way gave a chance to make that proverbial "stitch in time" and thus keep down the maintenance cost. This increased the load factor with a corresponding increase in the output.

Later plants were designed with motor drive throughout. Some of them stuck to the group driving of machines, while a few put in individual drives. Direct current was used exclusively, and although in plants of this type, the plant efficiency was greater than the old line shaft driven plant, or the combination line shaft and motor driven plant, yet the installation was quite short of the ideal. The direct current motors were not hardy or fool-proof enough, to stand up to the severe service and abuse they were subjected to. Burn outs were numerous and a great deal of trouble was experienced with the commutators and brushes, caused by the dust, heavy load and continuous service.

Before 1900 the use of electric motors to any great extent was practically unknown in the cement industry, but in less than six years they were introduced extensively in both old and new plants, and there were comparatively few plants that did not use electric motors on at least part of their equipment.

It remained however, for the induction motor to make the motor drive ideal. No commutator, no brushes, no rubbing parts, a machine that would stand all kinds of abuse—one that was practically fool-proof, one that could be cleaned off with a scoop shovel and dressed down with a cement sack, and with its dust tight bearings seemed to run just as good in the dust as it would under ideal conditions.

One of the first plants built to install induction motors making an ideal installation was the Union Portland Cement Company's plant at Devil's Slide, Utah, which was erected in 1906. Individual induction motor drives were installed throughout. Practically all of the motors were slow speed and were direct connected through the medium of an elastic coupling, to the pinion shafts of the crushers, ball mills, and tube mills. The elevators, conveyors and all small machines, were driven through the medium of cut gearing. The heavy drives were the ball mills which were driven by 50 h.p. motors, running at a speed of 168 r.p.m. and the tube mills being driven by 120 h.p. motors at 153 r.p.m. Although there were a great many predictions that these motors would never start the load (as mills required 175 per cent starting torque) yet no trouble was experienced, although no starting compensators were used. Each motor had its own starting panel, upon which was mounted one ammeter, one oil circuit breaker, with overload trip coil, and one three-pole, single-throw spade handle knife switch of proper capacity. In starting, the trip on the circuit breaker was held with one hand, and the knife switch thrown in with the other. When starting motors of this size, with mills fully loaded (taking not less than 175 per cent starting torque) and with full line voltage, there was of course a heavy pull on the line, which being only momentary, was taken care of very nicely by the turbines in the power house, and was scarcely noticeable.

In this plant which had a capacity of 2000 barrels of finished cement per day, there were four kominuters and five tube mills in the raw grinding department. One kominuter and two tube mills in the coal grinding department, and four kominuters and six tube mills in the cement-grinding department (a kominuter being a granulator very similar to a ball mill). If, for any cause the entire plant was shut down, care was taken in starting up, so that a number of these motors were not thrown on the line at the same time. For instance, the motors in the raw grinding department would be started first. After all the conveyor and elevator motors were started, the motor tender would start the large ones, one at a time, as fast as he could walk from one to another, the mills being set sixteen feet on centers. The cement grinding department would then be started in a similar manner—then the coal grinding department, and so on, and the entire plant could be gotten under headway in a few minutes. This installation proved very satisfactory and demonstrated the ability of the induction motor to start and drive fully loaded machines, without the necessity of friction clutches, and which required close to 150 to 175 per cent starting torque.

In the last five years in the neighborhood of twenty new cement plants have been built, representing close to 50,000 electrical h.p., and all but a very small proportion have used induction motor while the small proportion have used induction motor drives throughout, while the remainder used motors for their shaft drive on their main grinding units.

The quantity of Portland cement produced in 1911 was about 78,000,000 barrels. Estimating the production for 1912 to be 80,000,000 barrels, and that this amount is produced by plants running at 70 per cent of their full capacity for the entire year, we would have a production of 313,000 barrels per day of twenty-four hours in round figures. Assuming that 70 per cent of the power consumed in producing this 80,000,000 barrels of cement is furnished by electric motors, we would have an equivalent of 219,100 barrels for the motor's share of the daily production.

The power consumption of a plant depends a great deal upon the process, whether wet or dry—the type of grinding mills—the fineness of the finished product—and the character of the raw material. But to assume that 1½ motor horsepower is installed for each barrel of finished cement that is produced in a plant in 24 hours, and assuming 18 kw. hours for each barrel of finished cement produced, and a 72 per cent power factor, all of which are a fair average, we would have 328,650 h.p. stamped on the name plates of the motors, with the indicating wattmeters on the switchboards hovering around 245,500 kw. and about 340,000 k.v.a. on the generator.

In conclusion, these facts will prove the value to this industry that the induction motor has proven. Naturally, in a field of such vast extent there bave become many contributors and competition made more keen by so many producers. Competition has, too, necessitated the constant reducing of the cost of production. The extent of the use of this material in the future is merely a matter of familiarity by the manufacturer, the architect, the engineer, and even the farmer, to its use, and this familiarity is being gradually brought about by the lowering of the cost of production.

The electric motor has been a prime factor in reducing this and has helped to make it possible to put this most valuable building material on the market at a price that will allow its use in substitution of practically all other building materials.

[The foregoing paper was read before the Portland Section of the American Institute of Electrical Engineers on December 17, 1912.]

NEW FRENCH ELECTRIC STEEL PLANT.

It is reported that the well-known French armament company Schneider, Creusot, along with the steel company the Societe des Hauts Fourneaux et Forges d'Allevard, are about to erect a large plant in Pontcharra (Isere Department) for the electrolytic production of steel. It is stated that the electric furnaces employed will be among the largest yet laid down. It is intended to erect a hydroelectric station for the generation of power.

ELECTRICAL PUMPING AND IRRIGATION

FALLS IN CANALS.

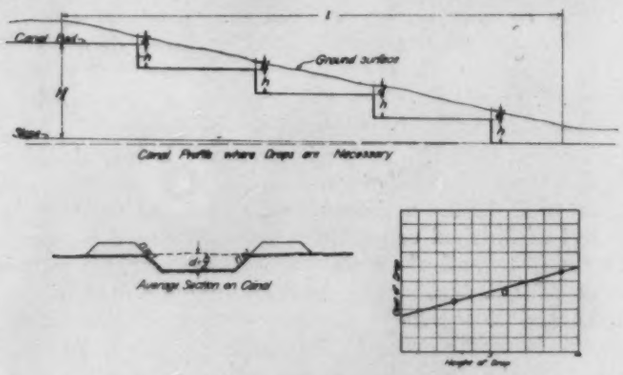
BY B. A. ETCHEVERRY.

Excessive slope.

When possible it is always desirable to select for the grade of the canal the actual slope of the country. It often happens that the actual slope of the country is so great that this would give a velocity which would cause erosion. To prevent this it is necessary to use a grade which will give the proper velocity and to concentrate the excess fall at suitable points along the canal by means of falls or rapids.

Location of falls.

The proper location must be near the place where the canal bed if continued without drop would have to be carried in embankment. A fall should not be



Diagrams Illustrating the Determination of the Economic Height of Drops.

built entirely in embankment for the dangers of breaks are too great. When the surface slope is not uniform, falls or chutes will generally be placed at those points where there is an abrupt drop. When the surface slope is uniform they will be spaced about equal distances apart and will be of about the same height. The choice will be between high drops spaced far apart and a greater number of low drops spaced close together. High drops spaced far apart will give a greater amount of earthwork in the canal excavation, but the total cost of drops may be less as shown in the accompanying sketch. In any case of uniform slope there is an economic height of drop which will give the minimum total cost of drops and canal excavation. This is determined as follows:

Economic height of drops for a uniform ground slope.

Let v = minimum depth of cut.
b = bottom width of canal.
$n : 1$ = side slope of canal.
A = area of cross section.
h = height of one drop.
l = total length of canal considered.
H = total excess fall in length l.
n = number of drops in length l.
V = total volume of excavation.
C_1 = cost of those parts of a drop which are common to drops of any height such as wings, floor, etc.
K = constant depending on type of drop.
C_2 = cost of a single drop.
C_3 = total cost of drops in length l.
C_e = cost of excavation per unit volume.
C_4 = total cost of excavation.
C = total cost of drops and excavation.

To determine C_1 and K the type of drop must be decided and the cost of drops of various heights must be estimated. These costs with the corresponding heights must be plotted. The curve joining the points will give a straight line. The intersection of this line with the cost axis will give C_1 and the slope of the line will give K. This is shown in the plot given below. The relations between the different elements are:

$$C_2 = C_1 + Kh$$

$$n = H/h$$

$$C_3 = \frac{H}{h}(C_1 + Kh) = \frac{C_1 H}{h} + KH$$

$$A = (d + h/2)\ [b + n(d + h/2)]$$

$$V = lA = l(d + h/2)\ [b + n(d + h/2)]$$

$$C_4 = VC_e = lC_e(d + h/2)\ [b + n(d + h/2)]$$

$$C = C_3 + C_4 =$$

$$= \frac{C_1 H}{h} + KH + lC_e(d + h/2)\left[b + d\left(d + \frac{h}{2}\right)\right]$$

$$C = \frac{C_1 H}{h} + KH + lC_e\left[bd + \frac{bh}{2} + n\left(d + \frac{h}{2}\right)^2\right]$$

To obtain minimum cost.

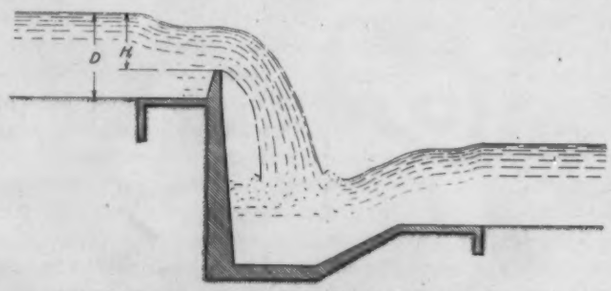
$$\frac{dC}{dh} = \frac{C_1 H}{h^2} + lC_e\left[\frac{b}{2} + \frac{2n}{2}(d + h/2)\right] = 0$$

$$\text{or } h^2 + \left(2d + \frac{b}{n}\right)h^2 - \frac{2C_1 H}{nlC_e} = 0$$

The effects of falls on flow of water in the canal, are:

1. An increased velocity upstream.
2. Impact and erosion of falling water downstream.
3. Erosion caused by eddies on downstream side.

1. Increased velocity upstream. This is due to two causes: a drop in the water surface at the crest, and a gradual drop in the water surface extending a considerable distance upstream. In the first case the



Raised Crest of Breast Wall of Drop to Prevent Increase in Velocity Up-Stream.

water drops as it passes over the breast wall of the drop and the depth of water on the crest of the wall will be about 2/3 of the depth of water measured a short distance above the crest. This action is not objectionable for it only extends a few feet upstream. It cannot be prevented but may be resisted by a short floor on the upstream side. The second effect will not occur if the discharge over the drop and the carrying capacity of the canal are made equal when the

level of the surface of the water is kept the same at the drop as in the canal above it. This may be obtained by three methods.

(a) Use the same depths of water over the crest of the breast wall as the depth of water in the canal and compute the length of breast wall which will give equal capacities.

Let l = length of crest.
D = depth of water in canal.
Q = carrying capacity of canal for depth H.
v = velocity of approach.
m = a constant for discharge over weirs.

$$Q = ml\left(D + \frac{v^2}{2g}\right)^{3/2}$$ Capacity over breast wall.

$$l = \frac{Q}{m\left(D + \frac{v^2}{2g}\right)^{3/2}}$$

The disadvantages of this method are: (1) the length of crest corresponds to the depth of water in the canal for which it was computed and only works perfectly for that depth. (2) This method requires that the width of the canal be contracted to the length of the crest. The effect of this contraction on the downstream side is to increase the erosion caused by eddies which always occur when passing from a smaller section to a larger one, or from a higher velocity to a lower one.

(b) Use a length of breast wall greater than obtained by above equation and raise the crest of the wall to a height which will maintain the upstream water level at its normal height. The width of the breast wall is generally made equal to the average width of the canal. The height of water passing over the crest of the breast wall is obtained by the equation $H_1 = \left(\frac{Q}{ml}\right)^{2/3} - \frac{v^2}{2g}$. If D = depth of water in canal, then the crest must be raised above the bed of the canal upstream a height of $h = D - H_1$. The objections to this method are: (1) The height of the raised crest is correct only for the carrying capacity for which it is computed. This can, however, be remedied by using flashboards to regulate it for other depths. (2) It increases the height of fall. This however, is not serious. A third objection which is sometimes made is that it requires a longer breast wall than obtained by the first method. This, however, may be more than balanced by the smaller length of wing walls. The advantage of this method is that it reduces erosion by eddies on the downstream side. This makes this form more desirable than the first one.

(c) Use a notched raised crest. This is obtained by extending the breast wall above the canal bed up to full supply level and dividing it into a number of trapezoidal notches so designed that for any carrying capacity the depth of water in the canal and the depth at the notch are equal. The theoretically correct form requires curved sides but in practice a trapezoidal notch is sufficiently accurate. To design the notched wall it is first necessary to determine the length between abutments, the number of notches, and the dimensions of the trapezoidal opening. The following empirical rules are recommended in India:

1. Make the total length of breast wall between side walls equal to from 1 to 7/8 times the average width of the canal.
2. The number of notches depends on the top width of notches and the length of the crest of the piers separating them.
3. The top width of notches should not exceed the depth of water in the canal and may vary from 3/4 to 1 times the depth.
4. The top length of crest of piers should not be less than 1/2 the depth.
5. The distance between notches center to center is about 1 1/2 times the depth.

To determine the bottom width and side slopes of the trapezoidal notch it is necessary to obtain the formula for the flow through a notch drop in terms of the bottom width and the side slopes and solve

Series of Drops on Comanche Canal, Colorado.

for these quantities by applying the formula to two special cases for which the discharges and the corresponding depth of water in the canal are known. The carrying capacity should be selected to represent the usual conditions of flow in the canal and the corresponding depths are obtained by means of Kutter's formula. The formula for flow through a notch, neglecting the velocity of approach and the solution for base width and side slopes of notched openings are obtained with aid of the calculus:

Let b = bottom width of notch.
n : 1 = side slopes of notch.
H = depth of water.
H_1 and H_2 = depth of water for special cases corresponding to Q_1 and Q_2.

The dimensions of the notched openings are obtained from the above formula. The trapezoidal piers separating the openings are designed as cantilever walls. The edges of the piers are tapered or rounded as indicated below and at the foot of the notch on the downstream side a semi-circular lip or shelf projects horizontally. The object of this lip is to discharge the water in a fan like shape and decrease the erosive power of the water.

The above three methods will prevent only one cause of the increased upstream velocity; the other cause due to the curve of depression at the crest of the fall only extends a few feet and can be resisted by an upstream floor or paving extending a short distance upstream from the crest. In many cases no protection is used.

READINESS TO SERVE METHODS

THE INVESTIGATION BUREAU.

BY ROSS B. MATEER.

To possibly no cause, other than the haphazard manner in which current consuming apparatus is marketed and installed for industrial and agricultural purposes, can the complaints of poor service, so numerous with some quasi-public utilities, be traced. Ninety out of every hundred claims of high bills are not a fault of the central station, but directly due to the equipment and its operating characteristics. The motor equipment in the factory may be arranged for group drive, yet a careful investigation results in a plan of individual motor drive possessing increased over-all efficiency and reflected in decreased monthly current consumption.

The fluctuations in voltage, with subsequent speed variation, reduce the output of finished product in the mill and the overloading of a motor continuously in excess of the 25 per cent limit results in damaged apparatus. While in the first instance it is obviously up to the power company to improve the service, is it not, too, the part of wisdom to inspect the motor equipment when a utility is anxious to provide service?

An agriculturist, confident of the profits accruing by intensive cultivation of his soil and possible with irrigation facilities, interviews machinery supply houses, purchases a pump and motor, which is shipped to its destination, there to be installed by the "help" around the ranch. Excessive power bills are noted, the quantity of water delivered to the soil is not equal to expectations and naturally the power company is criticized. Misunderstandings of this character are general where the right pump and motor are not selected and properly installed. An appeal to the power company usually results in either additional transformer capacity for the installation or in referring the consumer to the supply houses for relief, which, if not obtained, retards the general growth of electric service.

How best to handle complaints of the character mentioned and others arising by reason of a just or fancied grievance, is a problem to many central stations, each of which is desirous of popularizing electricity. Some refer complaints on bills to those who re-read the meter, and if checked, promptly pass the bill for collection. Complaints on voltage are followed by a voltmeter reading at or near the time the service is declared poor. Few have attempted to supervise the operation of an industrial installation, though a general inspection of all apparatus, with reference to efficiency and service would be welcomed by the owner and operator.

It does not seem that the interest of the utility should end with the delivery of current at one point, irrespective of the service rendered, when confidence in electrical apparatus and its general use is to be encouraged at the expense of the reputation of a utility with quantities of its product to market.

Again, campaigns may be successfully launched for the general introduction of a particular applianace, but is it not equally important to continue in service those current-consuming devices now on the lines and which in many ways are misunderstood, not alone as to operating costs, but as to characteristics, load factor and power factor?

Consider, if you please, the varying phases of investigations, such as: Checking meters as to accuracy; supervision of line regulation; securing of charts on commercial, residential and power feeders; determination of load factor for each industrial and agricultural installation; the demand, maximum and average, occasioned by various industries; the revenue per horsepower demand with reference to locality. All of these are now functions of many departments of a utility, each striving to obtain such data as pertains to its own welfare at often a high cost. Would it not be infinitely better to establish and maintain a bureau of investigation and include as functions of the department, all phases of operation, and service, as pertain to the satisfactory solution of problems affecting the operation and cost of apparatus, wherein the power company and the public are mutually interested? The investigation bureau would thus constitute itself an arbitrator where needed. As to the personel of such a bureau, it should be under the absolute direction of a competent engineer, thoroughly conversant with commercial methods and cognizant of operating and accounting.

Included and assisting this bureau should be an industrial engineer, and one or more cadets, graduates of a university or technical institution. An organization as outlined, encouraging confidence, "does not pass the buck," eliminates competitive power, other than electrical, and stimulates the general use of electrical apparatus by its zeal for a square deal alike to utility and consumer.

PLAN ELECTRIC SYSTEM FOR THE PHILIPPINES.

To join all the towns of Albay Province in a network of wires conveying electric current for lighting and domestic purposes is the work planned by a number of Filipino capitalists of that Province, headed by the wealthy Imperial family.

The work, including the erection of power house, transformers, and wire installation, will begin as soon as a franchise has been secured from the government, and negotiations are already under way for the purchase of motors, dynamos, and other necessary machinery and material.

The power house will be located at a convenient point near a stream between Guinabatan and Camalig, and current will be conveyed by means of transformers to Legaspi, Albay, Daraga, Camalig, Guinabatan, and Ligao. As soon as these towns have been connected, it is the intention of the company to extend the line to the coast towns, including Tabaco, Malilipot, Bacacay, and Libog.

THE BERRY IMPULSE TURBINE.

BY S. L. BERRY.[1]

In making a commercial comparison of the Francis turbine, the Berry impulse turbine and the single jet impulse water wheel, it is considered unnecessary to go into the details of what is known as the "type characteristic" method of comparing various kinds of water wheels. It is generally accepted and has been used recently in an experimental determination of the best design for the largest turbines built to date. The system takes the form of a certain range of numbers within which a particular type of wheel is best adapted. For the single jet impulse water wheel this range is from 0 to about 4. The upper limit is not defined with exactness because varying conditions change the limit, but it is known that above 4 the efficiency falls off. The range for the Francis turbine is from 12 to 87, which has been divided into three or more parts, each suitable for a particular form of this turbine. The figures are those worked out by Zowski as giving generally acceptable limits.

It is seen that there is a gap between the upper impulse and lower Francis limits. This has been filled in various ways, by forcing the limits of both wheels until low efficiencies and other disadvantages have been met, by the use of multiple jets, multiple impulse wheels and a combination of the latter. None of these have been satisfactory from the standpoint of efficiency and cost.

The following example will show the extent of the gap:

Head 300 feet.

200 r.p.m.	Maximum power, single jet impulse wheel.	625 h.p.
	Minimum power, Francis turbine.....	5625 h.p.
300 r.p.m.	Maximum power, impulse wheel.....	280 h.p.
	Minimum power, Francis turbine.....	2520 h.p.
400 r.p.m.	Maximum power, impulse wheel.....	158 h.p.
	Minimum power, Francis turbine.....	1420 h.p.

In each case the minimum power which can be efficiently developed by the Francis turbine under the same head and at the same speed is nine times the maximum of the single jet impulse wheel. The new impulse turbine, which has a range from 0 to about 16, covers the entire range of the impulse wheel, the gap between the two and overlaps the Francis minimum limit. The maximum powers in the above cases for the impulse turbine are 10,200, 4580 and 2580 h.p.

The extent of this gap, for a head of 300 ft., is shown graphically in Fig. 1, in which curve 1 gives the maximum power of a single jet impulse wheel at various speeds, curve 2 the minimum for the Francis turbine and curve 3 the maximum for the Berry turbine. The vertical distances between curves one and two give the horsepower relations between the wheels represented, at the given speeds, and the space between the curves gives the general conditions of the gap mentioned.

The above comparison, as far as the Francis turbine is concerned, applies to heads up to 500 or 600 ft., as engineers have been very reluctant to use it under higher heads.

The number of jets which would be required to reach the minimum Francis limit may be calculated from the characteristics 4 and 12 as follows: $(\frac{12}{4})\,2 = 9$, or nine jets, on one or more wheels, are necessary to close the gap. A similar calculation for the impulse turbine, $(\frac{16}{4})\,2 = 16$, shows that it has the capacity of sixteen jets at any given speed. This can be reached with stream widths 37 per cent of those on corresponding impulse wheels, resulting in materially smaller buckets and lighter wheels.

The impulse turbine is similar to the impulse water wheel in that it is a free running wheel, without running water joints such as are found in the Francis and other turbines of the pressure type. It differs in that it has been designed so that it will receive water around the entire or any part of the circumference. It is therefore, not limited as to the head under which it can be operated, and while it will cover a field not heretofore covered satisfactorily, its greatest application will be found under those heads too high for the use of the Francis and other turbines of the pressure type, where, by reason of its ability to develop a given power at a much higher speed than would be possible with the impulse wheel, the cost of generators will be greatly reduced and freight and handling charges lowered.

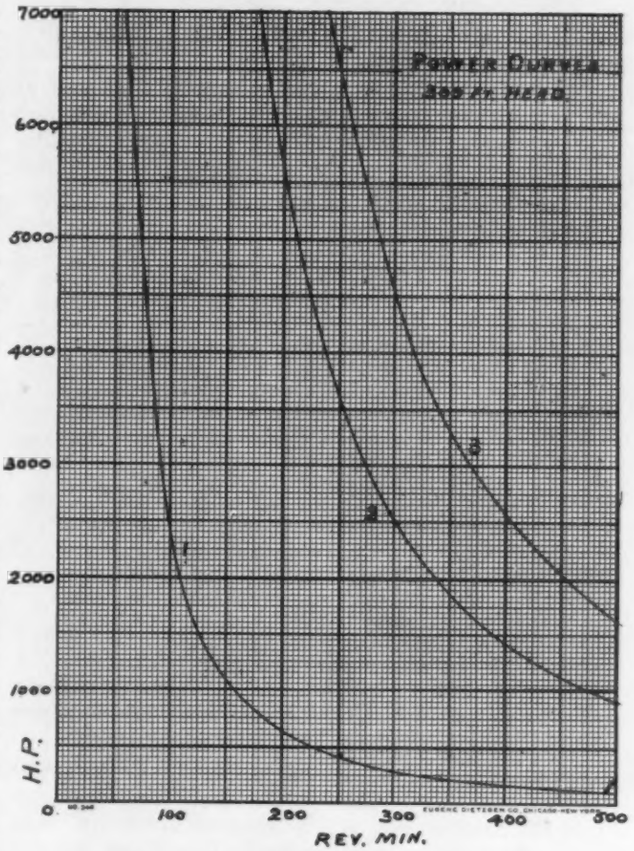


Fig. 1. Power Curves for 300 Ft. Head.

As speed is one of the controlling features in the cost of generators, it follows that the wheel which

[1]Consulting Hydraulic Engineer, Rialto Bldg, San Francisco.

will have the greatest speed for a given power and head, other things being equal, is the one which is commercially desirable. The impulse turbine, under these conditions, can be made so much smaller that it will make four times as many revolutions per minute as the single jet impulse wheel, and three times as many as the double wheel unit.

From a curve of approximate costs of 5000 k.v.a generators an example may be taken. Under a head of 620 ft. a double impulse unit would have a speed of 214 r.p.m. and the impulse turbine 600 r.p.m.

Speed.	Cost of Generator.	Frt. at 1½c.
214 r.p.m	$24,000.00	$3,000.00
600 r.p.m	15,000.00	1,575.00
	$ 9,000.00	$1,425.00

Giving a difference in cost of generator delivered at a terminal point on the coast of $10,425 to which would be added the difference in hauling and handling charges. There is to be added also the excess cost of a double unit with two housings, wheels, nozzles, gates, and the branch pipes.

For 10,000 k.v.a. units the figures are about as follows:

Head 1250 feet.

Speed.	Cost of Generator.
300 r.p.m.	$46,000.00
60 r.p.m	35,000.00
	11,000.00
Freight difference	2,000.00
	$13,000.00

Head 870 feet.

Speed.	Cost of Generator.
200 r.p.m.	$50,000.00
600 r.p.m.	35,000.00
	$15,000.00
	plus frt. diff. $17,500.00

Comparing the impulse turbine with the Francis in the field in which both may be used, it is found that the latter has running water joints around the outer circumference, that it must be balanced against end thrust, and that there are from 40 to 60 parts, inside of the machine, which move when the governor operates, while the former has no such joints, is self-balancing endwise and has 5 moving parts in the machine concerned with governor action. The greater simplicity make it a cheaper machine to construct and more durable in operation.

It is well known that the impulse wheel has a flatter efficiency curve than the Francis turbine, making it more efficient under part loads, and giving a marked improvement in what has been called the "all day efficiency." This advantage is equally possessed by the impulse turbine.

Emphasis may be placed upon a few of the points mentioned in patent No. 1,012,799, Dec. 26, 1911.

First, the limitations of the impulse wheel, as at present constructed, are well known. If more than one jet is used, they must be so separated that a bucket has discharged the water from one jet before it receives that from the succeeding one. Cases have been known where the second jet actually reduced the power of the wheel. This is an extreme case, seldom met with, but it shows tht danger of jet interference. Many cases have been found where the efficiency of the wheel falls off when the second jet is in use. While it is entirely feasible to use two or more jets, the wide separation required to retain good efficiency makes the construction unwieldy.

Second, when a vertical jet of water strikes a horizontal plate, there will be an equal spreading of the water in all directions. If the jet be inclined, the flow on the acute angle side diminishes, while that on the opposite side increases and the stream lines on the other two sides will be similar. If the plate be tipped up on one of the latter sides the water will crowd to the opposite side. It follows from the above that to produce the least deflection of a jet from the desired path, the transverse plane of the plate should be at right angles to the flow line.

Third, in a moving plate it is necessary to consider the relative flow line of the jet, which results from the relation of the direction and velocity of the circumference of the wheel and the jet. The relative flow lines of all impulse water wheels, as they have been constructed, are tangential to a larger or smaller circle, depending principally upon the relation of pitch and outside diameters. It is this condition which increases the danger of interference, and makes it necessary to widely separate the jets. As this circle of tangents decreases, so does the danger of interference within the zone of action of the jet, decrease, until the limit is reached when the relative flow lines are radial. At this point, considering a wheel with water applied around the entire circumference, all the water, relative to the moving wheel, is flowing radially, and has a minimum interference. With the pitch line of the wheel running at half the velocity of the water, this condition is found when the pitch diameter is about 0.7 of the outside diameter.

There are three types of regulating gates applicable to this turbine, first the one described in patent No. 1,025,240, May 7, 1912, which is a ring cut-off giving a contracting stream; second, a set of two rings reducing the water supply by closing in the side walls of the nozzle; third, a modification of the first. In all of these constructions it is possible to place the nozzle very close to the wheel, thereby maintaining control of the water up to the instant of its utilization. The method of control consists of two threaded rings, with gear teeth, and three pinion shafts, chain connected outside of the housing. There are five moving gate parts within the housing, all covered on their working faces and lubricated from without. Outside of the rings are placed packing rings, to which oil may be forced, and which can be washed out with water under pressure when desired. As these rings have a long circumferential to a short axial movement, the action should be smooth and easy.

It is evident that this turbine does not need to develop more than the ordinary range of efficiencies to find a wide application in the development of large water powers.

WATER POWERS IN NORTHERN CANADA.

Hydroelectric engineers in the employ of the federal commission of conservation, who have been gauging streams and examining possible water power in the Athabasca, Peace River and Slave Lake regions, the last two summers, say in a preliminary report that several million horsepower is available for development purposes. Two of the rapids in the north country are described as follows:

The Cassette, Mountain, Pelican and Drowned rapids, collectively known as the Fort Smith rapids, are situated on the Slave River and extend from Smith Landing to Fort Smith, 16 miles. This point being about 450 miles north from Edmonton and just inside the boundary of the province of Alberta. The various rapids, whose descents, taken separately, vary from 10 to 38 ft., may be considered as a continuous rapid from head to foot, broken by short intervals of swift water, giving a total descent of some 135 ft. in 16 miles.

It would probably be difficult to group all these rapids into one development, although it would be very desirable to do so from the standpoint of conservation, but the numerous islands and projecting points from the mainland afford natural conditions for easy development.

The volume of water in these rapids is enormous, being the combined flow of the Peace and Athabasca and their tributaries, with one of the great northern lakes, Lake Athabasca, acting as a reservoir to regulate the flow. The total power available during the season of navigation (May to November) by utilizing the total head of 135 ft., is estimated at 1,000,000 horsepower, and is divided among the different rapids in proportion to the head of each. Raw material for pulp and lumber industries is found all along the river and at the rapids.

The Peace River canyon has long been renowned for the wild character of its waters and no white man or Indian, be he ever so experienced in river work or urged by foolhardiness, ever attempts to run its rapids.

Rafts or boats, which, by carelessness or otherwise, are allowed to drift past its upper gates, are never seen again, being engulfed by some of its many powerful whirlpools. It is little wonder that the velocity of its waters should be so great when one considers, as has recently been ascertained, that the descent from head to foot is some 225 ft. in a distance of less than 18 miles. This immediately suggests its possibilities as a water power development.

The total minimum power available during the open water season (May to November), is estimated at 400,000 horsepower. This is based on the assumption that the total head of 225 ft. can be utilized. Its development for water power purposes will involve rather intricate problems, but to compensate for this, one must consider its situation near the raw material for pulp and lumber industries.

It is also at the head of navigation on the Peace River and lying adjacent to it are immense coal fields, large portions of which have already been staked out.

MINE GAS IGNITION BY LAMP FILAMENTS.

The Ignition of Mine Gases by the Filaments of Incandescent Lamps, is the title of Bulletin No. 52, which has just been issued by the United States Bureau of Mines. The authors, H. H. Clark and L. C. Ilsley, make the following general statement:

"As part of its investigations of the causes of mine accidents and of the safest and most efficient methods of handling electricity underground, the Bureau of Mines undertook a study of the ignition of mine gases by the filaments of electric incandescent lamps. This bulletin describes the investigation in detail, and gives a complete record of the results obtained.

"The investigation was undertaken for the purpose of determining the degree of danger that attends the use of certain specific sizes of incandescent lamps in atmospheres containing inflammable gas. Previous investigators have, to a greater or less extent, been concerned with certain theoretical features of the problem, such as the effect of the temperature and the dimensions of the lamp filaments, and the question whether a lamp may ignite gas by the heat of its glowing filament or by the spark that is drawn when the filament is broken. Although these features were considered in the present investigation and are briefly discussed in this bulletin, the principal object of the tests was to determine what sizes of incandescent lamps suitable for mine use would ignite explosive mixtures of mine gas and air, and what were the circumstances most effective in causing such ignition.

"The results of the investigation may be generally summarized as follows:

"The naked carbon filaments of standard lamps, burning at rated voltage, will invariably ignite explosive gaseous mixtures.

"If gas can reach the filaments of standard lamps without breaking the filaments or producing partial combustion within the bulbs, the explosive gaseous mixture is sure to be ignited.

"Several sizes of both standard and miniature lamps, when smashed while burning at rated voltage, will ignite gas.

"Standard lamps that do not usually ignite explosive gaseous mixtures may do so if the broken pieces of the filament cause a short circuit when the lamps are smashed."

A CENSUS OF UNDERGROUND CIRCUITS.

A movement that merits the hearty support of all is the census of underground circuits now being undertaken by G. M. Gest of New York, at his own expense.

It is planned to make a census of the underground conduits in the United States and Canada, as suggested by T. A. Martin, secretary of the National Electric Light Association.

There never has been taken a census of conduits, therefore there is no available data on hand as to how much conduit there is under the ground in the various cities and states, and because of the fact that this is so important a question, and is being agitated, more and more, from year to year, this data will be valuable.

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Electrical Training Aboard Battleships

Editorial comment was made in our issue of March 15th relative to apprenticeship systems for utility service. It would seem that the United States navy is proposing to give opportunities to young men which will prove of interest to embryo engineers of the coast. According to the draft, the U. S. Navy in cooperation with the presidents of the universities and colleges of the United States will train a limited number of students on board battleships. This training period will be of two months' duration and not more than twenty students will be assigned to one vessel. Training which will be given in engineering, electrical, gunnery, navigation and boat departments, will be thoroughly practical and will embrace every opportunity for actual experience.

Such a proposal is in thorough accord with the apprenticeship system outlined in the editorial above referred to and it would seem that Western power companies acting along parallel lines should not hesitate longer to initiate some workable scheme of cooperation with Western universities and colleges in properly rearing competent, enthusiastic and thoroughly trained young blood for future utility service.

Electricity in the Cement Industry

The national board of fire underwriters in reporting upon the San Francisco disaster of 1906 stated that, while the unquenchable walls of flame swept over and destroyed all other forms of buildings, less than five per cent of the reinforced concrete floors were materially damaged. So vast has now become the applications of Portland cement that the consumption of the past year totals the enormous utilization of over 80,000,000 barrels of this product. The interesting item to the electrical fraternity is, however, that in this production an installed capacity in electrical machinery of a third of a million horsepower is required.

Such rapidity of growth in an industry brought to light many interesting engineering problems. Unlooked for enlargements could never have been met had not the electric motor with its flexible independent drive been a possibility.

The detailed description of electricity as a factor in the development of the cement industry may be found on another page of this issue. The countless additional electrical powers necessary in the installation of the concrete sewers, water lines, telephone and telegraph posts, piles, bridges, barges and a thousand other applications make this industry a potent factor in the development of modern power consumption. Indeed the trend of the cement industry has gone one step further, for today in the concrete power houses and especially in the concrete pole construction the evolution of the hydroelectric art is itself put one notch higher.

It is interesting, too, to note that while electrical energy is thus a vital force in the manufacture of Portland cement, it is also in this self same industry affording the only safe method of preventing deleterious results from taking place.

In the manufacture of Portland cement by the

dry process many tons of fine dust are carried out of the kiln-stacks. The agricultural productivity of the surrounding district is consequently materially affected. It has been found that in a strongly magnetized field if a gas containing small suspended particles, such as dust, is passed through this field, the suspended particles are diverted from their upward course and deposit on the electrodes that supply the magnetized field. Thus at the Riverside Cement Company's plants in Southern California this process has been successfully applied and a stack-gas treater costing over $200,000 has there been recently installed. It would seem, then, that while new electrically propelled industries may at any time bring to life a harmful by-product, still this great unseen force when properly applied, may be made to correct every evil.

The Investigation Bureau

It makes little difference whether a human being is actually wronged or not. If he thinks he is wronged, the harm is done just the same and the utility company serving a community of ill-informed consumers may thus innocently expose itself to an onslaught wholly undeserved.

To fully protect itself from such unwarranted attacks, a wholesome educational and investigating campaign is absolutely indispensable on the part of the modern public utility company. This campaign should not be one of fitful starts or of sky-rocket acclaiming, but should rather by its even continuity of action impress the public with the evident spirit of fair play and earnest desire for quality in service that deep down, is the ruling motive for its establishment.

Electric service companies are fortunate in being free from two sins which from the very make up of the commodity sold to the public can never be laid at their door. In the first instance, electricity can not be frozen and in the second place no known method has ever been successful in adulterating the quality of this vital fluid. It is per se of one hundred per cent purity. About every other sin, however, for which Dante saw mortals roasting in the throes of his Inferno, has at one time or another, either justly or unjustly, been laid at the door of the hydroelectric or central station company.

Courtesy is a cheap commodity, yet it is surprising what it will accomplish when properly applied. The investigating department of a public service corporation is not the chamber of horrors it was some four or five years ago. In city service the alert utility companies of the West have accomplished by courtesy and conscientious effort a degree of efficiency and reduction of complaints far outranking any other class of public supply houses, such for instance as the grocer, the butcher, the baker or even the great department store. Those who have had access to the records bear up this statement without reservation.

In the agricultural or rural communities, however, the advance has been so rapid on all sides that the utility companies of the West have not kept pace with the needs or demands of this additional responsibility. Thus the over-zealous power salesman has urged the installation of larger pumping units than meet the best economic utilization of the rates agreed upon. Power lines have been promised and the farmer confidently planting his crops with full assurance of water for irrigation has been woefully disappointed in being able to connect up his pump at the appointed time. In other instances full details of possible costs for pumping installations have been misleading. Thus, a farmer is told that his pumping machinery and motor will cost so much, but upon completion of the task he has found that the "so much" did not include the concreting of the pit, the building of the pump shed, and a dozen other incidentals which in many cases have been known to double the cost of installation.

Again, the interest of the utility company should not end with the delivery of the current. A hundred other little niceties, tipped off to the farmer in his day of need and ignorance of matters electrical, will return a hundred fold to the power company in new consumers automatically "enthused" into using electrical energy by the well contented farmer.

New Records in Hydroelectric Development

The recent announcement that a 15,000 h.p. water power plant with but 30 cu. ft. of water per second dropping 5400 ft., is to be installed in Switzerland is a forceful reminder that fully apace with former years the trend of hydroelectric development is ever toward outdoing previous achievement. Last year witnessed the installation and initial operation of the largest water turbine units in existence at the White River plant of the Puget Sound Traction, Light & Power Company near Seattle. At present some sixty miles east of Fresno, California, on Big Creek, is being installed a 275 mile double steel tower transmission line from Big Creek to Los Angeles, which will break the world's record in voltage of transmission. Lake Spaulding in California, with its 300 ft. dam now under construction will submerge the deepest artificial lake ever attempted, while the Big Meadows dam in California proposes with its 50,000,000,000 cu. ft. of storage to outdo all other storage efforts in the world with the single exception of the Assouan Dam in Egypt. But not alone is Western effort to be found in the Pacific Coast States. Word has been received of the present activity of California electrical engineers in eastern Peru where an hydroelectric plant of the highest altitude in the world is being constructed. Thus the eastern slope of the Andes, tossing its waters from a 14,500 ft. elevation above the sea will once again remind the civilized world of the riches to be found in the classic land of the Incas. This time, however, the gold to be captured by the "invading Pizzaro" is not to be accomplished by fraud and treachery of the adventurous Spanish spoiler, but the modern Prescot in his "conquest of Peru" will be enabled to relate the wonders of the ever-conquering hydroelectric power now world-wide in its scope.

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

H. N. Lauritzen, Pacific Coast manager for the Holophane Company, is at Los Angeles.

Samuel Curwen, president of the J. G. Brill Company of Philadelphia, is at San Francisco.

W. L. Goodwin, vice-president and general manager of the Pacific States Electric Company, is at Portland.

Frank Parrish has left the employ of the Western Electric Company at Seattle to become salesman for the Fobes Supply Company, Seattle.

H. E. Sanderson, Pacific Coast manager of the Bryant Electric Company, has returned to San Francisco from a trip through the Pacific Northwest.

Floyd G. Dessery announces the removal of his offices to suite 511-14 Central Building, Sixth and Main streets, Los Angeles, where he will continue practice as civil and hydraulic engineer.

M. M. Godman, an attorney of Seattle, has been appointed as chairman of the Washington Public Service Commission by Governor Lister. Mr. Godman succeeds George A. Lee, resigned.

R. W. Clark, formerly of the Minneapolis General Electric Company, has been made assistant sales manager of the Puget Sound Traction Light and Power Company instead of assistant manager as heretofore announced.

Dr. S. S. Wheeler, president of the Crocker-Wheeler Company, is at San Francisco to supervise Crocker-Wheeler business on the Pacific Coast and to look into the question of a Crocker-Wheeler exhibit at the Panama-Pacific Exposition.

S. K. Colby, vice-president of Allen and Peck, Inc., of New York City, and of Pierson, Roeding & Co. of San Francisco, was at San Francisco during the past week in connection with the formation of the Pacific Coast Electric Railway Association.

Roy Griswold, for some years engineer in charge of the Empire building and other properties in Seattle and patentee of an elevator door control design, providing for greater safety in the operation of elevators, has gone into the A. G. Electric & Manufacturing Company. He will have charge of the panel board and switch board department.

Mortimer Fleishhacker has been elected president of the Great Western Power Company; **Guy C. Earl,** vice-president; **H. P. Wilson,** vice-president and secretary; **Washington Dodge,** vice-president; **James Irvine, B. H. Dibblee, Chaffee E. Hall, W. H. Spaulding, A. C. Bedford, A. W. Burchard, W. S. Crandall, R. B. Young** and **C. E. Maynard,** directors, and **F. M. Tompkins,** treasurer.

Leslie W. Symmes and **Thos. H. Means,** agricultural engineers, together with **A. E. Chandler,** irrigation and water right specialist, who was formerly secretary of the American Engineering Corporation, have formed a new engineering firm to be known as Symmes, Means & Chandler, to undertake agricultural engineering. The firm will be located in the new Holbrook Building in San Francisco after May first.

Munson Burton, district manager for the Westinghouse Lamp Company, whose Pacific Coast business will hereafter be conducted independently, has organized his department at San Francisco with **H. H. Daley** and **H. H. Graham** as salesmen, **F. A. Youngholm,** treasurer, and **H. F. Hartzell,** correspondent. Mr. Daley and Mr. Graham are well known to the Pacific Coast trade, while Mr. Youngholm and Mr. Hartzell have come from the East to assume their new duties.

B. S. Josselyn has tendered his resignation as president of the Portland Railway, Light and Power Company, to take effect July 1, 1913, so as to get rest after six years service as the company's head. The board of directors at their meeting on March 26th passed resolutions expressing the good will of the company and the regret of all as to his decision. Portland business men signified their esteem for **C. M. Clark,** chairman of the board of directors of the company, and Mr. Josselyn, by assembling nearly 200 strong at a testimonial luncheon given in honor of them at the Commercial Club on March 27th.

SACRAMENTO REJUVENATION.

Sacramento, Cal., was put on the Jovian map on March 29th, when twenty-three members were admitted to the mysteries of Jovianism with the assistance of members from other California cities, under the direction of Statesman A. H. Halloran of San Francisco. The time was auspiciously opportune, for on this night Sacramento's new electrolier system was ablaze for the first time and added to the general brilliancy of the event.

Nearly half of the party of visiting Jovians took the journey by boat from San Francisco up the beautiful Sacramento River on the night of the 28th. This party was augmented by the presence of the ladies and entertained by cards and music on the way up, as well as by automobile sight-seeing excursion through the hospitality of the Sacramento electrical men.

Other members arrived from all quarters by twos and threes during the day, so that when the rejuvenation was called to order there were twenty-eight Jovians present. The ritual was well rendered by a team made up for the occasion except for the presence of five veterans. The degree team was as follows:

Jupiter, A. E. Drendell	Vulcan, A. V. Thompson
Neptune, G. I. Kinney	Mars, A. H. Elliott
Pluto, A. E. Rowe	Hercules, Geo. Curtis
Imps, J. A. Herr	Apollo, W. R. Dunbar
S. L. Hawkins	Avrenim, J. J. McKee
Frank Havey	Mercury, J. W. Redpath
Harry Sayles	

E. M. Schlessinger took care of the electrical effects and G. I. Kinney presided at the piano. The following were initiated and are now fully constituted members of the Jovian Order:

C. J. Asymus, Foreman State Department of Engineering.
J. L. Blide, Marysville.
A. P. Broughton, Foreman Electrician.
A. E. Commerford, Mgr. Commerford & Guckow.
W. C. Dolan, Electric Supply Co.
R. C. Eyerly, Supt. of Construction.
C. R. Gill, Supt. Elec. Distribution, Pac. Gas & Elec. Co.
J. C. Hobrecht, Electrical Contractor.
C. A. Lamus, Sec. Graham & Lamus Co.
J. W. McCurdy, Supt. Tel. & Tel. Asso. Oil Co.
G. H. Middlemiss, care Underground, Pac. Gas & Elec. Co.
A. J. Myers, Dis. Mgr. Wagner Elec. & Mfg. Co.
T. L. Nightingale, Supt. of Constr. Elec. Supply Co.
F. Osterloh, Asst. Chief Electrician.
G. S. Pearce, City Electrician.
A. P. Peck, Sales Mgr. Electric Supply Co.
H. J. Raffin, National Carbon Co.
W. B. Sawyer Jr., General Electric Co.
Tom Scott, Scott, Lyman & Stark.
W. A. Strand, Electrical Contractor.
W. H. Sutton, State Capitol Electrician.
H. K. Tackaberry, H. W. Johns-Manville Co.
Julius Wardell, Mgr. W. A. Strand.

After the rejuvenation a supper was served to fifty in the Elks' Club, A. L. Drendell presiding as toastmaster. A stirring address on co-operation was delivered by Albert H. Elliott, the other speakers being C. V. Schneider, W. A. Strand, G. D. Jones, W. S. Hanbridge, G. S. Pearce, Geo. Curtis and A. H. Halloran.

While the rejuvenation was in progress the ladies in the visiting party were entertained at the theater and by a card game, through the courtesy of the management of the Hotel Sacramento and the Sacramento ladies.

Special credit for the success of this rejuvenation is due to C. V. Schneider and Geo. Curtis, who devoted much time and energy in getting the class together and in perfecting local arrangements. The members of the degree team are also to be congratulated on their good work, great credit also being due to those out-of-town members who, by lending their presence to the meeting, greatly added to its success.

A message of good will and best wishes was received from Reigning Jupiter F. E. Watts just before the meeting, in which he gave notice of the appointment of A. E. Rowe as Statesman for Oakland, in recognition of his efforts at recent rejuvenations.

Announcement was also made of the fact that the San Francisco Jovians had ordered a magnificent set of new costumes for the degree team and that arrangements were being made for rejuvenations at Fresno, Santa Barbara and San Francisco within the next few months.

The Sacramento Jovians, now that the spirit of co-operation has been instilled, plan to form a lunch club and already have quite a nucleus of application for another rejuvenation at an early date.

PACIFIC COAST ELECTRIC RAILWAY ASSOCIATION.

The Pacific Coast Electric Railway Association was organized at San Francisco on April 1st at a meeting of the representatives of twenty-five electric railways operated in Washington, Oregon and California. The new association is a section of the American Electric Railway Association, which was represented by five officials, at the meeting—Charles N. Black, first vice-president of the national society and of the United Railroads of San Francisco; James H. McGraw, president of the McGraw Publishing Company of New York City; Harry C. Donnecker, secretary of the association, and E. H. Baker of the Galena Signal Oil Company, vice-president of the American Electric Railway Manufacturers' Association.

The Pacific Coast Electric Railway Association has been formed along the lines pursued by the New York State Association, the Central Association, which takes in Ohio, Indiana, Illinois and Iowa, and the Southwestern Association, which embraces Texas, all of which are sections of the national body. Its objects are to cultivate better public relations for street railways and secure publicity for the difficulties and problems of traction companies.

The project for holding the 1915 convention of the national organization in San Francisco originated at a meeting in New York City last January. In deciding so far in advance to hold the 1915 meeting in connection with the exposition the American Association departed from its usual custom, which is to postpone the decision until the year of the meeting.

The following officers were elected: President, Samuel Hild, general manager of the Portland Railway, Light and Power Company; first vice-president, T. T. C. Gregory, vice-president of the Vallejo and Northern line; second vice-president, A. W. Leonard of the Puget Sound International Railway and Power Company of Seattle; treasurer, Norman Logan of the Northern Electric Company; executive committee, T. T. C. Gregory, W. E. Dunn of the Los Angeles Railway Company, Paul Shoup of the Pacific Electric Company of Los Angeles, Charles N. Black, vice-president and general manager of the United Railroads of San Francisco, D. L. Huntington of Spokane, president of the Washington Water Power Company, Guy Talbot, president of the Pacific Light and Power Company of Portland, Ore., and W. R. Alberger, vice-president and general manager of the San Francisco-Oakland Terminal Railway Company.

REMOVAL NOTICES.

The Northern California Power Company, Consolidated, announces the removal of its offices to the David Hewes Building, 995 Market street, San Francisco, Cal.

The Westinghouse Electric and Manufacturing Company announce the removal of their Los Angeles offices to I. N. Van Nuys Building, corner of Seventh and Spring streets.

The Brooks-Follis Electric Corporation have moved their store from 24 Second street to 123-131 Second street, San Francisco, where more space and greater convenience will enable them to better handle their increasing business.

Chas. C. Moore & Company, engineers, are occupying temporary quarters at 40 First street, San Francisco, while a magnificent new building is being erected on the site which they have occupied at First and Mission streets since 1906. Ample warehouse and shop equipment has been secured in the neighborhood.

MEETING NOTICES.

Seattle Jovians.

The weekly meeting of the Seattle Jovian League held at the Rathskeller March 28th was an informal affair. The discussion revolved around the electrical pageant to be presented during the "Potlatch" this summer. The Jovians have decided to take an active part in making the pageant a success and the league will be represented by an appropriate float.

Alameda County Electrical Development League.

The regular monthly meeting of the Electrical Development League of Alameda County (California) was held at Oakland, March 29th. The principal subject for discussion was Senate Bill No. 738, which covers the licensing of persons engaged in making electrical installations. Mr. W. H. Gribble of the Kimball Electric Company gave a talk on the necessity of friendship and harmony between competitors before true co-operation can be attained. J. A. Vandergrift presided at the meeting.

The San Francisco Electrical Development and Jovian League.

The regular weekly meeting was held Tuesday last. Mr. Paul T. Carroll was the speaker of the day and addressed the members on the subject of co-operation of the Chamber of Commerce of San Francisco with the League. Mr. Carroll, in addition to being a director of the former organization, is also a director of the United States Chamber of Commerce. Upon the conclusion of his remarks resolutions were adopted looking toward the formation of an electrical committee of the chamber of commerce which shall be composed of League members who are also members of the chamber of commerce.

Portland Branch, N. E. L. A.

The next regular meeting of the Portland branch of the N. E. L. A. will be held at 8 p. m. on April 8, 1913, in the new hall of the Electric Circle of the Royal Academy, located on the northeast corner of First and Alder streets. Mr. E. A. West, the newly elected chairman, will preside. Dr. E. W. Lazell, Ph. D., will present a paper on "Design and Operation of Cement Plants." Dr. Lazell is one of the members of the firm of Edwards & Lazell, consulting chemical engineers, located in the Railway Exchange Building, Portland, Oregon.

Portland Electric Club.

This club is composed of employees of the Portland Railway, Light and Power Company, of which Mr. F. W. Hild is chairman. On Wednesday evening, March 26, 1913, Mr. C. M. Clark, chairman of the executive board of the concern, who resides in Philadelphia, gave a talk to the members of the organization.

Mr. Clark said in part: "It is your duty to serve the public honestly and faithfully. Therefore, when you come in contact with the error of a patron, explain to him the true situation, so that he may get a proper understandling of it. Loyalty and a conscientious performance of duty are the most important points in the career of an employee."

Other short talks were made by B. S. Josselyn, F. I. Fuller, C. M. Huggins and O. B. Caldwell.

Portland Jovian Luncheon Club.

Mr. W. H. Lines, industrial power engineer of the Portland Railway, Light and Power Company, gave the Jovian Luncheon Club a talk on "The Field for Industrial Power Development in This Country, and More Especially in Portland." Mr. Lines gave a large amount of interesting data and told of how industrial engineers had been attacking the problems submitted to them.

Mr. Geo. A. Boring, of the Pacific States Electric Company, was elected as the new member on the executive committee. Mr. C. P. Osborne was chairman. This finishes Mr. Osborne's term of office, and Mr. F. D. Weber of the Underwriters' Equitable Rating Bureau will preside as chairman for the month of April.

Due to the fact that Mr. E. G. Hopson, supervising engineer, U. S. R. S., has been called to Washington, D. C., on official business, it is impossible for him to address the Jovian Luncheon Club on April 10th. Consequently, Mr. L. R. Alderman, who has been recently appointed City Superintendent of Public Schools of Portland, will address the club on "The New Education."

Oregon Technical Club.

Governor West was unable to fill his engagement with the Oregon Technical Club and asked Mr. John T. Whistler to be his representative. Mr. Whistler spoke on the "Columbia Southern Project." He said in part:

"This project was started in 1902 and is far from complete now. The primary reason for its failure to date was the fact that the State never assumed any responsibility in the matter." The last Legislature came to the rescue of the settlers who were involved in this irrigation project and appropriated $450,000 to complete this project under the direction of the "Desert Land Board" of the State of Oregon. It is provided that this money and $5.00 per acre on the land in this project, when reclaimed, shall be set aside as a "revolving fund" for aid to other projects. The amount of land to be reclaimed is 22,000 acres."

Mr. H. R. Wakeman, chairman of the local section of the A. I. E. E., read the resolutions passed by the A. I. E. E. in regard to the appointment by the United States Congress of a "Patent Commission." Mr. W. H. Crawford, chairman of the day, suggested that every organization represented in the Oregon Technical Club take this matter up with their respective organizations and get endorsement of these resolutions.

The local chapter of the American Institute of Architects invited the members of the Oregon Technical Club to a lecture of "Fireproofing," to be delivered by Mr. McMasters of Youngstown, Pa., in their club rooms, 297½ Stark street, at 8:30 p. m., March 28, 1913.

Seattle Safety Committee.

The semi-annual banquet to the members of the safety committees, Seattle Division, Puget Sound Traction, Light and Power Company, was held at the Butler Hotel on the evening of March 20th. Officials and employees to the number of about 100 were present. George Carson, general claim agent, acted as toastmaster. Those responding were: D. W. Henderson, "The Old and the New Trainmen"; H. S. Elliott, "The Passenger and the Trainman"; R. R. Upton, "Safety in Its Relation to the Public"; A. J. Falknor, "The Unreported Accident"; G. A. Richardson, "The Safety Report and Its Value"; J. T. Rupli, "Relations Between the Trainmen and the Accident Investigators"; G. B. Harrington, "Barn Bogies"; A. L. Kempster. "Co-Operation." Among the invited guests were: A. W. Leonard, vice-president and general manager; James B. Howe, general counsel; W. J. Grambs, superintendent light and power; Frank Dabney, assistant treasurer; W. E. Best, auditor; Morton Ramsdell, sales manager; E. C. Gaumnitz, purchasing agent; Hugh A. Tait, attorney; A. J. Falknor, attorney; H. S. Elliott, attorney; N. W. Brockett, attorney; R. G. Sharpe, attorney; Park Weed Willis, chief surgeon; H. B. Thompson, surgeon; E. A. Batwell, publicity agent; J. E. Allison, superintendent of inspection; F. T. Marsh, superintendent of employment; J. T. Rupli, assistant claim agent; C. F. Young, adjuster, claim department; O. B. Ayers, adjuster, claim department; E. H. Worthen, investigator, claim department; R. R. Higley, investigator, claim department; C. Lidston, investigator, claim department; R. R. Upton, safety lecturer, claim department; C. L. Hammons, record clerk, claim department.

This organization, known as the Safety Committees, came into existence over a year ago, beginning with what is known as the Central Safety Committee and Division Safety Committees, afterwards organized. The organization of the committee was based on the idea of reducing the number of accidents to the smallest possible minimum. Every employee is a member of the "Safety League." Keeping a look-out for defective cars, defective tracks, defective tools, etc., and reporting to the chairman of the Central Safety Committee are some of the things required for the prevention of accidents. George Carson, general claim agent, is the present chairman of the Central Safety Committee.

BOOK REVIEWS.

Engineer's Handbook on Patents. By William Macomber. Size, 4½ x 7 inches; 288 pages; leather binding. Published by Little, Brown & Co. of Boston, and for sale at the Technical Book Shop, 106 Rialto Building, San Francisco. Price, $2.50.

The author of the work is a leading patent lawyer and professor of patent law in Cornell University Law School. He maintains the day of the whistling and whittling Yankee who managed occasionally to produce something patentable has passed, and that the important inventions of the future must be made by trained graduates of engineering school. In the "Engineer's Handbook on Patents" are presented the theories which underlie successful inventions and tend to guide the inventor on successful lines, both as to the law and the theory of patents. A careful study of the book will enable the user to avoid lines of thought which have resulted in past failures on the part of other inventors and will inform him of the steps necessary to secure for himself the full benefits of a successful invention. The matter of what is patentable is exceptionally detailed and complete, and the entire text is fortified by quotations from and citations to the decisions of courts of last resort. The book is certainly indispensable for Western engineers who seriously entertain taking out patents for their inventions.

Electricity and Magnetism. By Robert H. Hough and Walter M. Boehm. Size, 5½ x 7½ inches; 233 pages; 93 illustrations; cloth binding. Published by the Macmillan Company of New York, and for sale at the Technical Book Shop, 106 Rialto Building, San Francisco. Price, $1.10.

The authors of the book, both of the department of physics in the University of Pennsylvania, have conceived its contents as a leader in developing elementary principles of electricity and magnetism for students in engineering. The entire subject is logically covered and almost seven hundred equations are developed which are numbered and recapitulated for quick reference in the rear of the book. The book will not be found useful for non-technical students, but for those technically prepared and wishing to brush up on points in theory it is excellent. A commendable feature of the book is an extensive set of problems at the rear of each of the twenty-seven chapters, many of the answers to which are appended. The book has a comprehensive index. It will be found extremely useful for a text book in elementary courses of physics and should serve a useful reference for engineers not desiring the deeper books of reference such as Thomson and Maxwell.

THE ELECTRICAL CONTRACTORS' DEPARTMENT

RECOMMENDATIONS FOR ELECTRICAL INSTALLATIONS IN WOOD WORKING PLANTS, MANUFACTURING PLANTS, WAREHOUSES, PACKING HOUSES. CANNERIES, MINING PLANTS, ETC.

COMPILED BY F. D. WEBER.[1]

The nature of the occupation carried on in buildings of the above mentioned character, subjects all types of "open and concealed" wiring to extremely severe mechanical injury, making deterioration very great and maintenance cost very high and the efficiency of the system extremely low. The presence of moisture, corrosive fumes, heat, salty atmosphere, pickling vapors, steam, etc., impose conditions which are extremely detrimental to all fittings, conductors, metal conduit and insulating materials. Also the presence of inflammable dust of all descriptions, accumulations of large quantities of inflammable materials and hard usage introduce a very pertinent fire hazard which demands special consideration.

After careful consideration of the various methods of wiring now in common use, we strongly recommend the installation of approved rigid or flexible iron conduit in all "special hazards," and more especially in wood-working plants, manufacturing plants, mining plants, packing houses, warehouses, canneries, etc. There being only a very few places where other methods of wiring can compete for recognition with approved rigid or flexible iron conduit, and it is an open question whether or not the conduit is not superior even under all conditions. Where conduit is subject to severe conditions, modifications in the methods of installation should be made, which will aid the conduit system to meet these special conditions and give satisfaction.

Conduit wiring when properly installed closely approaches the ideal, and it has the following advantages which should recommend it, safety, satisfactory operation, convenience, neatness, ultimate economy and flexibility as regards additions and changes, to existing systems, as conductors can be removed and replaced so readily.

"In all electrical work, conductors, however well insulated, should always be treated as bare to the end that under no conditions, existing or likely to exist, can a ground or short circuit occur, and so that all leakage from conductor to conductor, or between conductor and ground, may be reduced to the minimum."

"In all wiring special attention should be paid to the mechanical execution of the work. Careful and neat running, connecting, soldering, taping of conductors, and securing and attaching of fittings, are especially conducive to security and efficiency, and are strongly advised."

The following recommendations are based on requirements of the current edition of the National Electrical Code, and all wiring, apparatus, etc., not specifically mentioned herein must conform to the standard rules and requirements of the above mentioned Code. Rule references given are from the Code, and should be carefully read.

Where Current Is Generated at the Plant.

1. Generator and Switchboard should be located in the engine room if possible; when this is not practicable, a room should be especially provided for this purpose. The generator should be insulated from the ground and kept clean and dry, so as to prevent the accumulation of waste and dust. (Rule 1, sections a and b.)

2. Switchboard must be constructed of slate or marble mounted on an angle iron frame, or of hardwood in skeleton form, well filled to prevent absorption of moisture. Must be accessible from all sides, at least 18 inches from the wall and 10 or 12 inches from the floor, and not extend to the ceiling. The space back of the board must not be used for storage. (Rule 3.)

3. Conductors from the generator to the switchboard may be run exposed overhead, supported on porcelain knobs or single wire cleats, or may be placed under the floor if encased in continuous lengths of approved metal conduit. Each end of the conduit should extend well above the floor and be provided with an approved terminal bushing at the switchboard end and an outlet box or condulet at the generator end. (Rule 2.)

As specification for generators usually call for at least a 25 per cent overload for stipulated period of time (generally two hours) without injurious heating or sparking at the brushes, all leads, bus bars, switches, circuit breakers, ammeters, etc., used in connection therewith must in all such cases have a corresponding excess capacity over and above the normal rating of the machines.

Equalizer connections between generators should be as short, direct and as low resistance as practicable. Equalizer connections should not be less than area of main leads in generator, and never of a greater resistance than the series lead to bus bars.

Connections to balancing coils on the neutral leads of three wire generators should also be short, of ample capacity and low resistance.

For the carrying capacity of wires and cables see Rule 18 National Electrical Code.

Note: The question of voltage drop is not taken into consideration in the above tables.

4. Feeders from the switchboard to the centers of distribution or branch cutout cabinets must be installed in the same manner as hereinafter specified for branch circuits. (See Sections 7 and 11 of this article.

5. Feeders running out of doors to adjacent buildings should be of weatherproof insulation outside buildings, supported on petticoat glass insulators and kept 12 in. apart. Porcelain knobs or cleats must not be used where exposed to the weather. (Rule 12d.) These wires must enter and leave buildings in the manner of service wires hereinafter specified (in Section 7 of this pamphlet) for overhead service connections. (Rule 12f.)

It is advisable to have a main cutout and switch for each building, so arranged that the entire current may be cut off from each building. This cutout and switch may be placed in the cutout cabinet located nearest to point of entrance of feeder wires.

Where Current Is Supplied From an Outside Source.

6. Transformers should be located on poles in the yard at a safe distance from any building (at least 10 ft. from the walls of frame buildings). (Rule 14.)

"Where transformers are to be connected to high voltage circuits, it is necessary in many cases, for best protection to life and property, that the secondary system be permanently grounded, and provision should be made for it when the transformers are built." (Rules 14-15.)

Must not be placed inside of any building excepting central stations and substations (except as provided in Rule 36a, N. E. C.), unless by special permission of the Inspection Department having jurisdiction. (Rule 14a.)

Must not be attached to the outside walls of buildings, unless separated therefrom by substantial supports. Must not be attached to frame buildings when any other location is practicable. (Rule 14b.)

(To be continued.)

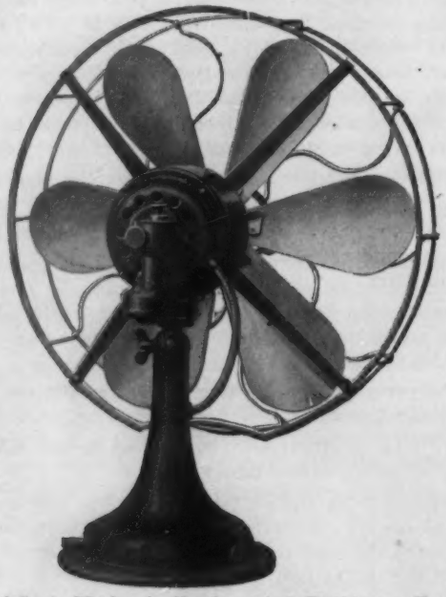
[1]Electrical Inspector for Underwriters' Equitable Rating Bureau, Portland, Ore.

INDUSTRIAL

WESTINGHOUSE 1913 FANS.

The attractive drawn steel frame fans introduced by the Westinghouse Electric and Manufacturing Company last year are continued for the 1913 season with such minor changes as experience has shown advisable. The quiet-running, six-blade type of fan has been extended to include the sixteen-inch size and the oscillating type.

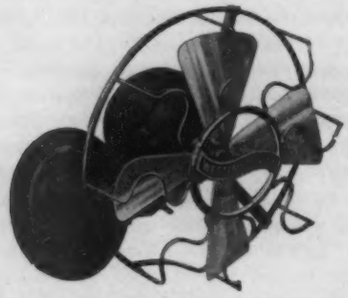
There has also been added an induction-motor type of 8-inch fans to the line, this fan being constructed with drawn steel frame like the 12 and 16 inch sizes, and has a dull black



16-Inch Mechanically-Operated Residence Fan.

finish. The Westinghouse line now includes 8-inch desk and bracket and telephone-booth fans and 12-inch and 16-inch fans in both four-blade and six-blade styles of the stationary desk and bracket type and the oscillating type; also 12-inch and 16-inch exhaust fans and a large variety of ceiling, counter and floor column fans.

The popular six-blade 12-inch residence type has been extended this year to include the 16-inch fan also. This six-blade because of its slow speed is extremely quiet in operation and for this reason is particularly adapted to places where quiet is essential. The 12-inch size has already proved extremely popular in bedrooms, hospitals, professional offices and similar places, while the 16-inch size is designed especially for theaters, libraries, halls and other public places.

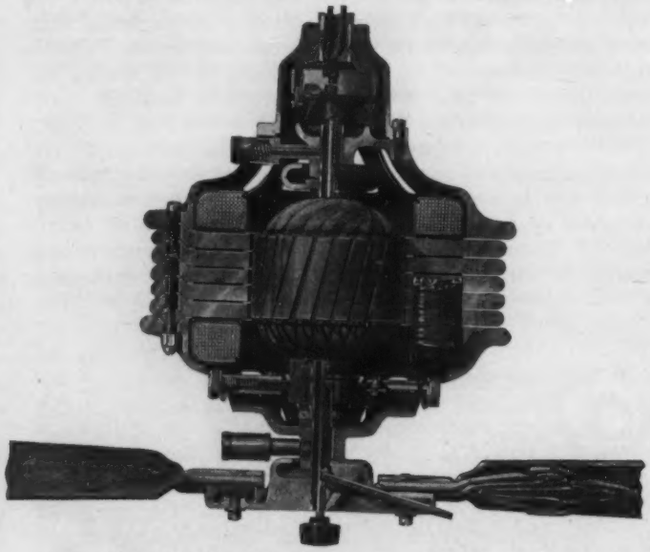


8-Inch Desk and Bracket Fan, Induction Type.

Quiet operation is obtained by the use of a slow-speed motor, while the proper amount of air at this speed is moved by employing a six-blade fan.

A feature of the Westinghouse fans is a patented swivel and hinge joint which gives the highest possible range of vertical and horizontal adjustment. By the use of the wing nut adjustment the fan can be tilted forward 15 deg., backward 90 deg. or rotated 340 deg., a stop ring preventing complete rotation so that there is no danger of breaking the leads. To change the fan from desk to bracket mounting, all that is necessary is to loosen the wing nut, tilt the fan backward to the desired angle, and then tighten the wing nut.

Westinghouse oscillating fans are furnished in two



Cross-Section of 54-Inch D. C. Ceiling Fan.

types, mechanically operated and air operated. The mechanically operated fans have drawn steel frames and the oscillating mechanism is entirely enclosed and will not drop oil. It consists of a lever driven by a crank disc which is operated from the motor shaft by two gear reductions, a worm and a spur. The spur gear is the slow-speed reduction. Both the worm wheel and the worm can be renewed without tools. The worm wheel drives through a ball clutch. If the fan guard strikes an obstruction during the course of oscillation, the fan merely stops oscillating without interfering with the operation of the motor. This prevents the burning-out of the motor or the overturning of the fan. The oscillating movement can be stopped instantly by raising the knurled head on top of the mechanism and can be started by pushing this head down. Both operations can be effected while the fan is operating.

In the air operated oscillating fan the motor frame and the base are of cast iron. The position of a pivoted vane determines the direction of oscillation of the air operated fan. At the end of the oscillation a lever, geared to the vane, comes in contact with a stop and turns the vane 90 deg. The fan then swings around in the opposite direction until the lever comes in contact with a second stop, which turns the vane for oscillation in the opposite direction. The location of the stops is adjustable, so that the arc of oscillation can be varied from 30 deg. to 360 deg. in steps of 30 deg.

The Westinghouse alternating current ceiling fans are furnished for 56-inch and 32-inch blade sweep and the direct current for 57-inch, 54-inch and 32-inch blade sweep. The alternating current counter column and floor column fans are furnished for 56-inch sweep and the direct current fans for 57-inch sweep.

CHANGE IN PAISTE TAPLET LINES.

The H. T. Paiste Company has recently made some important changes in their pipe Taplet line so as to further standardize these economical conduit fittings. In order to minimize the amount of stock required by dealers, through greater interchangeability of material, certain changes have been made in the sizes of wiring openings so that now three sizes of pipe Tablet covers are all that are required for all sizes of pipe Taplets. That is to say the first size of fittings and covers fits all ½ in. and ¾ in. pipe Taplets; the second size fits all 1 in. and 1¼ in. pipe Taplets and the third size all 1½ in. and 2 in. pipe Taplets; this means that the stock of necessary covers and fittings may be practically reduced by a half.

These changes do not effect in any way the size and design of the opening in the ½ in. and ¾ in. sizes and these still fit the standard fielding receptacles and rosettes which have been used for years in wooden molding wiring. With this combination of ½ in. and ¾ in. pipe Taplets and fieldings the most flexible and economical forms of either lamp or cord outlets are secured.

A NEW VERTICAL MOTOR FOR CEMENT MILLS.

In order to provide a thoroughly satisfactory drive for vertical machinery (such as grinders and pulverizers) in cement mills and other places where the service is very severe, the Westinghouse Electric and Manufacturing Company has built a line of specially designed vertical motors in sizes varying from 75 to 200 h.p., for both direct and alternating current circuits. The special feature of this motor is its strong, rugged construction. The motor frame is supported by a massive cast-iron base, which rests on slide rails with belt-adjusting screws.

The shaft is of very large proportions and the bearings are designed to withstand the severest stresses. The weight of the motor and the major part of the horizontal thrust due to belt tension are carried by a ball-bearing mounted within the motor base. This bearing is housed in an iron case and can be easily removed if the necessity arises. The bearings are automatically oiled, the oil being forced between the bearing surfaces whenever the motor is in motion. The ball thrust bearing runs immersed in oil.

The pulley is mounted inside the thrust bearing, which, together with the strength of the shaft and the rigid support afforded by the motor base, insures the elimination of distortion due to the belt tension so that the proper clearance is always maintained between the stationary and rotating parts.

The commutation of direct current motor is practically sparkless, so that brush renewals are rarely required and commutators are long lived.

NEW PRODUCT OF THE HOLOPHANE WORKS.

The Holophane Works of the General Electric Company, Cleveland, Ohio, have just placed on the market a new product, Sudan glass reflectors in Panelex design. Sudan glass is absolutely new in chemical composition, of very delicate amber tint, when lighted, and translucent. Its smooth surface is said to be ideal for lighting service, for though its finish is practically dust-resisting, there is no polish or glare. Specks, spots and other flaws have been entirely eliminated.

The Panelex design of reflector is just as new as the Sudan glass. This new style of reflector is without marked ribs or hollows that would catch and hold dust, and the lamp filament is hidden from the ordinary line of vision. Sudan glass in the eminently practical Panelex design is said to demonstrate, to a new degree, large possibilities of light diffusion and re-direction without loss of artistic worth. The reflectors are made in both the bowl and shallow types, and are particularly desirable for use in office buildings, retail stores, and some rooms of residences.

OREGON RULING ON OUTLET CLAMPS.

In the past, during the "roughing in" of a job of "knob and tube" work, the general practice has been to use "friction tape" to secure flexible tubing to gas pipes at combination outlets and at "straight electric" outlets to depend on the friction between the bored holes in the "headers" and the flexible tubing and the twisting together of the wires at the outlets. This practice was only a "make shift" and sanctioned because there were no "approved devices" to substitute for it.

Now the Underwriters' Laboratories, Inc., have examined and issued a report covering an approved "outlet clamp" for this purpose. This clamp will be found listed on page 50 of the October, 1912, List of Approved Electrical Fittings. Therefore, after May 1, 1913, the Underwriters' Equitable Rating Bureau will insist upon the use of this approved "outlet clamp" on all "knob and tube" work installed in this State.

NEWS OF THE ELECTRICAL CONTRACTORS

The Sound Electric Company, Seattle, has the contract for putting in thirty 500-watt lamps in the new public market.

Buxbaum & Cooley, electrical contractors, 68 Columbia street, Seattle, have under way the job of wiring the new Vanneck Theater at Bremerton, Wash.

William A. Mullins Electric Company, 1014 A street, Tacoma, has received the contract for electrical work on St. Martin's College at Lacey, Washington.

The Pacific Fire Extinguisher Company have secured the contract for the electrical installation in the new Lawyers' Building, located on the southwest corner of Park and Washington streets, Portland.

Ne Page, McKenny & Company, Seattle, Wash., are just completing the new public library building in Portland, Oregon, and the Gray building on the northwest corner of Seventh and Morrison streets, Portland, Oregon.

The Reynolds Electric Company, formerly at 520 First Avenue South, Seattle, is now located at 310 First Avenue South. The company recently installed the electrical equipment on the presses of the Seattle Sun, the new evening paper

The Coast Engineering Company of Portland are installing the electrical equipment of the new moving picture theater that is being built by Foster & Kleiser. The theater is located on the east side of Sixth street, between Washington and Stout streets.

The M. J. Walsh & Company of Portland, Oregon, are installing the electrical installations in the Monarch Oil Company's new buildings, located north of the city on the Willamette River. They have also the electrical contract for factory No. 2 of the Portland Woolen mills located at St. Johns, Oregon.

Gray & Barash, electrical engineers, 63 Columbia street, Seattle, are installing an individual motor drive to take the place of steam driven equipment for the packing plant of Barton & Company on the tide flats. The motors vary in size from 2 to 40 h.p. They are all constant speed, two-phase, induction motors. The entire equipment was supplied by the General Electric Company, and 190 h.p. was contracted for from the Puget Sound Traction, Light & Power Company.

The Columbia Electric Company, Seattle, has the contract for furnishing the electrical fixtures for the Bellingham postoffice building. The same company has the contract for conduit wiring on the Bellingham National Bank, also for wiring the Presbyterian Church and the Byron Hotel in that city. Considerable work is also being prosecuted at Fort

Ward, Fort Casey and other points. R. H. Walker is manager for the company, with office and place of business at 1019 Columbia street.

The West Coast Engineering Company have been employed by the Hawley Pulp & Paper Company of Oregon City, Oregon, to install generating equipment in their mill for power and lighting purposes. The equipment will consist of one 150 kw., 480 volt, three-phase, 60 cycle alternator; one 80 kw., 480 volt, three-phase, 60 cycle alternator; one 75 h.p., 480 volt, three-phase, 60 cycle induction motor, and ten small size motors ranging from 3 to 10 h.p. Beside the installation of the above apparatus, new lines will be installed connecting all the mill units together on the same system, and the wiring will be completely overhauled throughout the plant. A new mill unit is also being built which will also be wired and in which will be installed the 80 kw. generator. Power for driving the generators will be furnished by water wheels which are already installed and which are a part of the original equipment of the mill.

The City of Portland, Ore., has awarded the contract for the lighting of the new Broadway bridge across the Willamette River to the West Coast Engineering Company of Portland. This work will cost the city approximately $21,000 and will result in what is claimed to be the finest lighted bridge in the world. There will be about two hundred two-light cast-iron brackets, and fifty five-light curb electroliers, on which will be used 100-watt Mazda lamps. There will also be a decorative system installed consisting of approximately seven thousand four-candlepower carbon lamps. This will all be permanent work, consisting of type R. J. condulets and Sheraduct conduit throughout. The lamps will be mounted upon all the main steel members of the bridge and along the sidewalk level, and it will be 18 inches between the lamps. The system which will be used on the Broadway bridge will present some special features in this construction, the details of which will be given after the work has been completed.

TRADE NOTES.

An order for a new switchboard has been placed by the Olympic Power Company with the Westinghouse Electric and Manufacturing Company for its power plant at Elwha Canyon near Port Angeles, Washington. It is an eleven-section circular-controlled desk board to replace the one destroyed by the flood some time ago.

The Oro Electric Corporation has awarded the contracts for its new transmission line material as follows: The towers will be furnished by the Aero Company, the Locke insulators by Pierson, Roeding & Co., and the sale for the copper was made by the Telephone-Electric Equipment Company, the metal being produced at the mills of the American Electrical Works.

E. J. Barry, electrical engineer for the St. Paul & Tacoma Lumber Company, at Tacoma, announces that the company has ordered a 1000 kw., 480 volt, three-phase turbo generator and is installing a 75 kw., three-wire d.c. turbo generator, switchboard, etc. The main generator is intended to operate completely the electrically driven planing mill and all auxiliary apparatus. The company is considering the advisability of an electrically driven sawmill.

The Alaska Water, Light & Telephone Company of Valdez, Alaska, has contracted with the Pelton Water Wheel Company for a 500 h.p. single discharge Pelton-Francis turbine with Pelton governor, fly-wheel and mechanically-operated relief valve. This turbine unit operates under 140 ft. head and is direct connected to a General Electric three-phase alternator. The current will be used for the company's lighting and power circuits in Valdez, and at Ft. Liscum, Alaska.

The General Electric Company has sold to the Pacific Gas and Electric Company for their station A in San Francisco a second 15,000 kw. 720 r.p.m. vertical Curtis turbine generating set with condenser base proportioned for 31,000 sq. ft. of cooling surface when equipped with one-inch tubes; also two CC4, 100 kw., 3000 r.p.m., 125 volt, flat compound wound Curtis turbine generator exciter sets and three 500 k.v.a. limiting reactances. The new turbine will have seven stages of expansion.

The A. G. Electric & Manufacturing Company, Seattle, reports a heavy increase in the steel box trade throughout the territory. A number of jobbers, especially in Seattle and Portland, are handling this line of manufacture exclusively and are finding it a very satisfactory account because of the large demand. Several decided improvements have been made recently, which have resulted in a clean cut attractive looking product. This is partially due to the electric spot weld method of construction adopted a short time ago, thereby eliminating all rivets. Other improvements include a deep cover for the box, increasing the dust proof qualities.

The Vancouver Island Power Company have recently placed a large contract with the Pelton Water Wheel Company for a lap-welded and riveted steel pipe line for their new Jordan River development. The lap-welded piping will be furnished by the Ferrum Company of Germany, for whom the Pelton Company are exclusive United States agents, while the riveted piping will be built in the Pelton Company's Harrisburg, Pa., shops. A 13,000 h.p. Pelton-Doble tangential water wheel is included in this award. The system of the Vancouver Island Power Company now have installed Pelton-Doble tangential water wheels aggregating 84,000 h.p. or a total of about 97,000 h.p. with the last unit recently contracted for and placed on the line.

The Westinghouse Electric & Manufacturing Company has just received an order from the New York Edison Company for one 21,000 k.v.a. turbo generator wound for either 6600 or 11,400 volts, three-phase, 25 cycle current. The generator has two poles and the speed of the set is 1500 r.p.m. The generator is ordered complete with Westinghouse LeBlanc condenser and accessories. This set is said to be one of the largest turbo generators every built in this country.

In addition to the above, the order also covers the following apparatus: one 3300 k.v.a., one 1285 k.v.a., one 3850 k.v.a., six 500 k.v.a., twenty-one 2000 k.v.a., three-phase air blast transformers and two 96 kw. booster sets consisting of one 150 h.p. direct current motor and two 48 kw. direct current generators wound for from 30 to 60 volts.

The San Joaquin Light & Power Corporation have engaged J. G. White & Company to do the engineering and supervise the construction of a 6000 kw. hydroelectric installation on the Tule River and a 6250 k.v.a. addition to the Bakersfield plant. At Tule River there will be two 3000 kw. units, the contract for both the wheels and the generators having been awarded to the Allis-Chalmers Company. A 6250 k.v.a. unit is also to be added to the Bakersfield steam plant, Allis-Chalmers Company having the contract for the turbo-generators, and Charles C. Moore & Co. for the Stirling boilers. This will give the Bakersfield plant a total capacity of 15,000 kw. J. G. White & Co. are also preparing specifications and asking for bids for a 3000 kw. installation at the new San Joaquin No. 2 power house and the north fork of the San Joaquin River which will use the water from plants Nos. 1 and 3. The reconstruction of the small hydroelectric plant at the mouth of the Kern River is also contemplated so as to use existing power to better advantage. A 1500 k.v.a. steam turbine auxiliary is also proposed at Santa Maria to insure service now being supplied by transmission line.

NEWS NOTES

INCORPORATIONS.

MEDFORD, ORE.—Application has been made for the incorporation of the Medford & Interurban Railway, and J. G. Griffith of Oakland, Cal., and S. S Bullis of New York City are reported as backers of the enterprise. Mr. Griffith will be in Medford in a few days and meet with Mr. Bullis who is now here, when the final arrangements will be made. It is generally understood that Mr. Bullis has an option on the Barnum railroad.

RENO, NEV.—Articles of incorporation for the Rochester Water Company have just been prepared with a capital stock of $150,000 for the purpose of supplying the towns of Rochester Canyon with clear water from Indian Peak, a distance of four miles from the upper camp. The company has been formed by J. G. Huntington, Judge J. M. Savage, Frank Richardson, M. Castle and F. B. Hargett, all of Rochester. They claim to have a gravity system to bring the water into the head.

TRANSMISSION.

SAN FRANCISCO, CAL.—The contract for electric current used by the harbor commissioners will expire June 30.

WHITE SALMON, WASH.—The Northwest Electric Company has purchased a 160 acre tract from Roy Chubb, a few miles above Husum Falls, containing a power site to be developed as part of the company's system.

MARTINEZ, CAL.—Eingineers are stringing two new power line cables across Carquinez straits for the Pacific Gas & Electric Company to increase the facilities for supplying electric light and power for the exposition grounds in San Francisco.

KIRKLAND, WASH.—The Puget Sound Traction, Light & Power Company, Seattle, has made application to the town council of Kirkland across Lake Washington for a light and power franchise. Extensive developments are being carried forward in that section.

FRESNO, CAL.—The board of supervisors has passed an ordinance granting a franchise to the Pacific Light & Power Corporation to construct and for the period of 50 years to operate and maintain an electric tower and wire system across certain public highways in the county of Fresno.

ONTARIO, ORE.—Representatives of the Beaver River Power Company, the principal office of which is in Boise, were in Ontario recently looking over the field, and announced that their company will apply for a franchise here in the near future. The company is extending its line through the Snake River valley and will enter the electric lighting field of Nyssa, Ontario and Vale.

SAN FRANCISCO, CAL.—An application has been filed with the railroad commission asking modifications as to the use of the money to be derived from the sale of $5,000,000 bonds of the Pacific Gas & Electric Company, the issuance of which was authorized last September by the commission. The original order allowed these uses to be made of the money: Construction account of the Drum power plant to 40,000 kw., $1,650,000; transmission lines from the Drum power plant to Cordelia, $1,389,000; construction account dam and spillway, $2,280,000; canal, etc., from Lake Spaulding to Drum power plant, $1,274,500; water department, $1,250,000. The company desires to divert $590,000 of the money for increasing the capacity of the Bear River Canal from 50 cu. ft. of water a second to 350 cu. ft. It also desires to build three new power houses, one near Clipper Gap, one near Auburn and one in Auburn ravine, north of Newcastle, at a cost of $2,396,000. These plants will have an installed capacity of 35,000 kw., and an average capacity of 26,000, the cost of developing thus being $6845. The company in its application states that it is not only engaged in work on the Drum plant, but that by the concrete dam at the outlet of Lake Spaulding, which is under way, four billion cubic feet of water will be added to the supply of two billion feet now impounded in its 15 reservoirs in the Sierra. But this dam will not be completed this year. During 1913 it will be up to 260 ft. and will impound three billion feet, and the full capacity cannot be reached until 1914, when it will be 300 ft. high. In the meantime the Drum power house will be running under a light load, and it is the opinion of the officers of the company that it is advisable to use some of the proceeds of bond sales in the three new power houses and on the Bear River canal.

ILLUMINATION.

OREGON CITY, ORE.—A franchise has been granted to the Beattie Gas Company to install a plant and sell gas in Oregon City.

BALBOA, CAL.—The West Coast Gas Company is enlarging its plant and installing a high pressure system at a cost of $37,550.

YUMA, ARIZ.—It is reported that the Southern Pacific Company intends very shortly to put in an electric lighting plant of its own at Yuma to supply light to its shops and yards.

WENATCHEE, WASH.—The Wenatchee Valley Gas & Electric Company has decided to erect a gas plant here and to pipe the city. The cost is estimated at about $100,000. The work of laying pipes will commence at once.

VENICE, CAL.—The city trustees of Venice have awarded the contract to the Coast Electric & Machinery Company for $14,940 for the installation of the ornamental lighting system in all streets and in the section of the city between Zephyr avenue and Marine street and trolley way to the Ocean front. Ornamental concrete posts will be used.

LOS ANGELES, CAL.—At a banquet held by the chamber of commerce of Huntington Park, a project was launched to light Long Beach avenue from Huntington Park to the sea. The chamber of commerce has been quietly conducting preliminary plans for lighting this last 15 miles of speedway, and when the matter was taken up the co-operation of Long Beach, Huntington Beach and Cudahy city was secured.

KLAMATH FALLS, ORE.—Klamath Falls is now receiving encouragement for a municipal light plant and an opportunity to use for the benefit of the people at least a part of the 200,000 h.p. of Link River, connecting the Upper Klamath Lake and Lake Ewauna, which river runs through the city of Klamath Falls. The U. S. Reclamation Service is to aid Klamath Falls in securing the free use of the water-power, or as much thereof as the city can use.

SACRAMENTO, CAL.—After several months' labor in getting together data City Engineer Givan has closed his reports to the city commission on subjects relative to the forthcoming municipal improvement bond election by submitting a report on the municipal electrical distributing plant, the total cost of which is estimated at $113,600. Givan recommends that the transforming station be located on the city

property recently acquired at Thirty-first and R streets, as it will be near the center of distribution. The substation is to be of fireproof material and its equipment will consist of such machinery as may be necessary for the character of work to be undertaken. The distributing center proper is to consist of 75 miles of pole lines, consisting of 3050 cedar poles and 125 miles of weatherproof wire and 825 inclosed series direct current street lamps with all necessary accessories. Givan estimates the saving to the city at $13,740 per annum for the distributing plant. Contrary to a popular idea, the intention of the city commission is to go into competition with the power companies, as the manufacture of electrical energy is not contemplated. The distributing plant is merely that physical property for which the city property now pays an annual lease of $5.50 per lamp per month, and for which no other power company but the Pacific Gas & Electric Company can bid because that corporation owns the distributing plant. The city officials desire that the municipality own its plant, so that all power companies can bid for the contract to furnish the city with electrical energy. It is believed by that means a rate much lower than ever received will be obtainable.

TRANSPORTATION.

TIGARDVILLE, ORE.—Citizens are making an effort to have the Newberg and McMinnville Electric Railway extended to this place.

MEDFORD, ORE.—M. T. Minney Company, Oakland, has transferred franchise for interurban to F. B. Waite, Roseburg, and associates. Work is to be started before April 10 and rushed to completion.

PORTLAND, ORE.—The state railroad commission has advised the East Side Commercial Club that authority to force the Portland Railway, Light & Power Company to establish cross-town lines lies with the city. One line will be requested.

SAN FRANCISCO, CAL.—The supervisors have passed to print by unanimous vote the ordinance authorizing the board of public works to let the contract for the extension of the Geary Street Municipal Railway to the ocean beach via Thirty-third avenue, Balboa street, Forty-fifth avenue and Cabrillo street.

RIVERSIDE, CAL.—Bids have been received by the city council for two trolley franchises for which the Pacific Electric Company recently made application. The bid for the Magnolia avenue franchise to connect Riverside with Corona, $100, was accepted. The bid of $250 for the Market street franchise was held up pending matters in dispute between the city and the Pacific Electric Company.

OROVILLE, CAL.—A contract has been let by the Northern Electric Railway Company for a new freight depot in this city. The depot when completed will cost about $8000. S. T. Cobb, a local contractor, will have charge of the work. The old depot was totally destroyed by fire a short time ago. It is stated that as soon as the freight depot is completed, work will be begun on a new passenger depot.

LOS ANGELES CAL.—At a recent conference between the city officials and representatives of the Pacific Electric Company steps were taken toward the immediate relief of Main street traffic congestion. The company has agreed to make an opening in the rear of the present Sixth street depot, install a necessary bridge across Los Angeles street and a stairway for accommodation of southbound passengers and to have tracks at rear of the depot in operation within a week.

POMONA, CAL.—Extensive improvements which have been under way on Pacific Electric property on South Garey avenue are now practically completed. Four spur tracks have been run off the Garey avenue line just below the Pacific Electric station, and two continue on and connect with the Fifth street line for switching cars. It is evident improvements are being made with a view to eventually extending the line on through Chino and Corona, and also to care for additional traffic caused by the building of the Riverside-San Bernardino extension.

SEATTLE, WASH.—State Treasurer Meath, City Comptroller Carroll and Mayor Cotterill have opened negotiations for the sale of $300,000 of the $800,000 municipal street railway bond issue to the state, in accordance with Mr. Meath's letter to Mr. Carroll saying that the state would consider the purchase of the bonds. The sale of a portion of the municipal railway bonds is to be made for the purpose of reimbursing other city funds from which loans were made for the construction of division "A" of the city's street railway, beginning at Third avenue and Olive street and extending to Thirteenth avenue west and Nickerson street. A week ago the city council rejected three bids for these bonds as being too low, the council holding that the municipal street railway bonds were as good as any bonds issued by the city.

OAKLAND, CAL.—The railroad commission has issued an order in the matter of the application of the San Francisco-Oakland Terminals Railways to restore the rate to 20c. formally establishing the 15c rate on the following basis: Between Oakland and Davis street, San Lorenzo, 5c; between Davis street and Ashland Station, 5c; between Ashland Station and Hayward, 5c. In response to the petition of patrons of the road that there be a reduction in the commutation rate of $5 between Oakland and Hayward the commission fixed the rate at $4.50 for the entire month and $4 without the Sunday privilege. The petition of the Hayward chamber of commerce that the Western Pacific be directed to grant commutation rates was referred back to the chamber without prejudice, the commission holding that the case as it stood was not competent. The chamber of commerce was asked to submit evidence in the event of the petition being renewed.

TELEPHONE AND TELEGRAPH.

JEWELL, ORE.—The Centennial Telephone Company is planning to extend its system here.

PENDLETON, ORE.—Independent Telephone Company, Pilot Rock, have applied for a franchise here.

ESCALON, CAL.—The Escalon Telephone Company will soon commence the construction of a telephone line north of town.

EL CENTRO, CAL.—The Imperial Telephone Company has been granted permission to lay all its wires underground before street paving commences.

HOOD RIVER, ORE.—The county commissioners have been petitioned for a franchise for lines upon the county roads in Little White Salmon Valley west of the river, by the Underwood Telephone Company.

VICTORIA, B. C.—The Hon. Minister of Lands will receive bids until April 14 for the Forest Branch telephone equipment. H. R. McMillan, chief forester, Forest Branch, Department of Lands, Victoria, B. C.

OLYMPIA, WASH.—Charges that the Pacific Telephone & Telegraph Company, the Sunset Telephone & Telegraph Company and the Independent Telephone Company of Seattle, in violation of the order of the public service commission, have wilfully failed, neglected and refused to receive and transmit messages of the Northwest Long Distance Telephone Company, and have established unreasonable, unfair and discriminatory rules for the transaction of business, are made in a complaint filed by the Northwest company with the public service commission.